

# Electrical Contracting

THE MAGAZINE OF ELECTRICAL CONSTRUCTION AND MAINTENANCE



JANUARY, 1943

Shop circuit assembly of cable and boxes speeds wiring on prefabricated war housing projects. See Page 22.

INDUSTRIAL ELECTRIFICATION SECTION  
Pages 25-26



*Silvered Glass* WILL DO MOST OF  
THE METAL-REFLECTOR JOBS... *and Better, too*

ONE OF THESE  
THREE IS THE  
RIGHT FLOODLIGHT  
FOR THE JOB

**F**LOODLIGHTS with silvered-glass reflectors—as built by General Electric—meet, efficiently and reliably, the needs of night-shift protection. They give more light; they're easy to clean; they last longer.

As the list of noncritical materials dwindles, it takes far-sighted designing to keep ahead of the material shortage without sacrificing results. When the redesigned product has an appreciably higher efficiency, it's a real achievement. That is just what G-E floodlight designers have done.

G-E reflectors are built around a blank of high-transmission, blown glass on which is deposited a layer of silver. This is protected by an additional layer of electrolytically deposited silver. This backing is protected by a layer of fired-on porcelain enamel.

In addition to the unusually excellent, weather-resisting properties of this porcelain-enamel backing, the high temperature used in annealing automatically eliminates any weak reflectors which might otherwise crack and break early in service. The fragility generally associated with glass should, therefore, not be a decisive factor in the choice of a reflector. Furthermore, area floodlights are usually installed where mechanical hazards are negligible.

A G-E lighting specialist—located near you—is available to assist you in the planning of the most efficient lighting layout for outdoor protection and production. Write us today. *General Electric Company, Schenectady, N. Y.*



The Army-Navy "E", for Excellence  
in the manufacture of war equip-  
ment, now flies over six G-E plants  
employing 100,000 men and women.

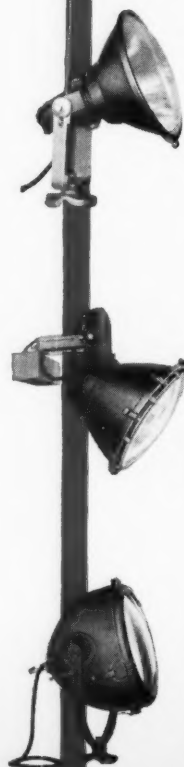
**GENERAL  ELECTRIC**

461-353-3899

**Low-cost, 300- or 500-watt floodlight.** This is the popular Type L-49. Has a glass combination reflector and housing reinforced with electrolytically deposited metal. The Type L-43 is similar in construction, takes a 750- or 1000-watt lamp. Bulletin GEA-3050A gives complete information.

**Specially designed for large-area lighting.** This floodlight, Type L-68, has a sheet-steel protective housing around its silvered-glass reflector. For prices and specifications write for Bulletin GEA-3317A.

**Designed for small- and medium-area lighting** and long-range applications. This unit also has a protective sheet-steel housing. Three sizes: 200, 500, and 750 watts. Completely described in Bulletin GEA-3929.

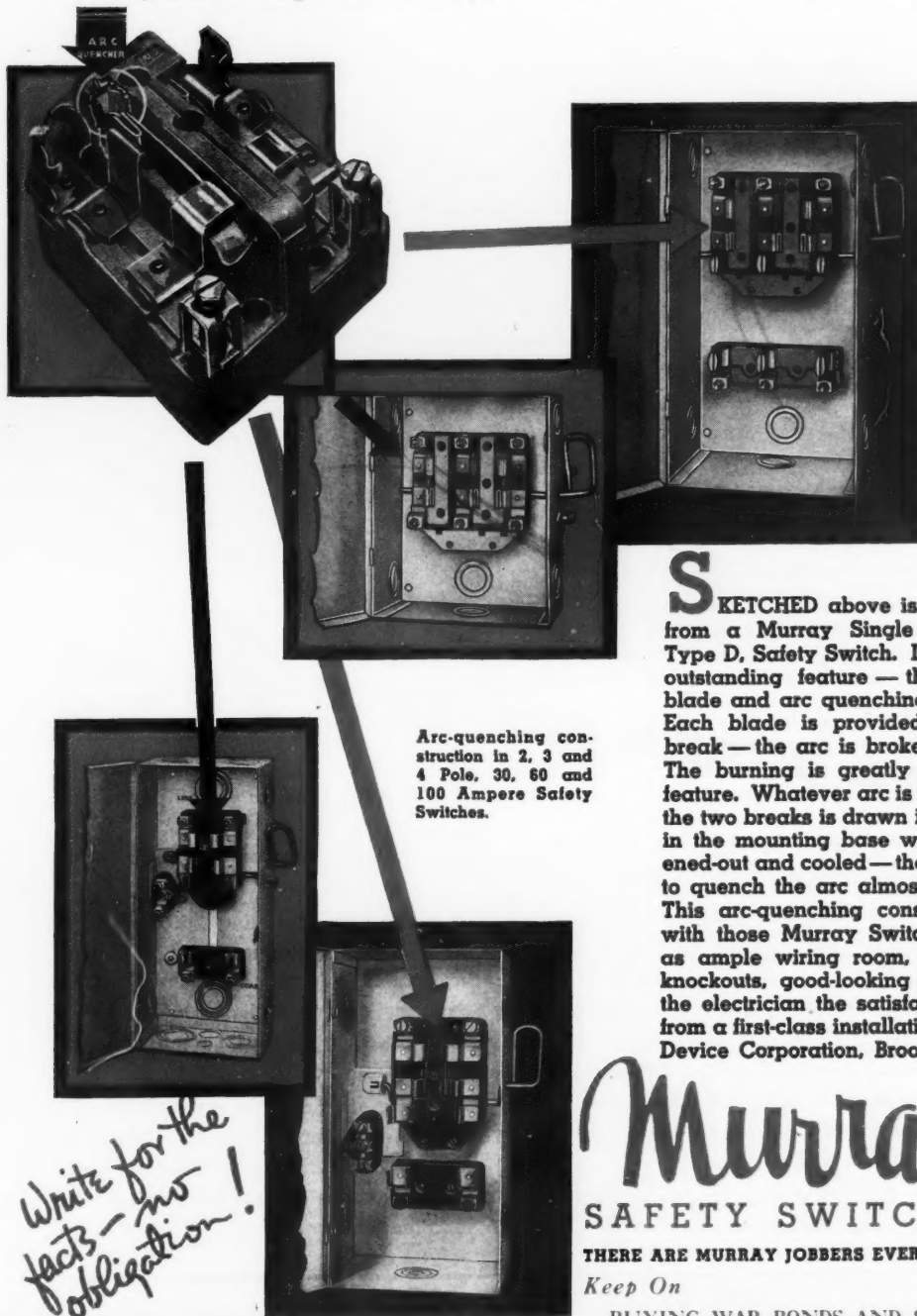




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V. 42  
1943

# "A FIRST CLASS INSTALLATION," *say electricians*

(and they also say, "SO EASY TO PUT IN")



**S**KETCHED above is the switch block from a Murray Single Throw, Fusible, Type D, Safety Switch. In the circle is the outstanding feature — the double break blade and arc quenching chamber. Each blade is provided with a double break — the arc is broken into two parts. The burning is greatly reduced by this feature. Whatever arc is formed at each of the two breaks is drawn into a narrow slot in the mounting base where it is lengthened-out and cooled — the effects co-acting to quench the arc almost instantly. This arc-quenching construction coupled with those Murray Switch characteristics as ample wiring room, properly placed knockouts, good-looking cabinets, assure the electrician the satisfaction that comes from a first-class installation. Metropolitan Device Corporation, Brooklyn, New York.

## Murray

### SAFETY SWITCHES

THERE ARE MURRAY JOBBERS EVERYWHERE

Keep On

BUYING WAR BONDS AND STAMPS

ELECTRICAL CONTRACTING. Published monthly, price 25 cents a copy, Vol. 42, No. 1. Allow at least ten days for change of address. All communications about subscriptions should be addressed to the Director of Circulation, Electrical Contracting, 330 West 42nd Street, New York, N. Y. Subscription Rates — U. S. A., and Latin-American Republics, \$2.00 a year, \$3.00 for two years, \$4.00 for three years. Canada \$2.50 a year, \$4.00 for two years, \$5.00 for three years. Great Britain and British Possessions 18 shillings for one year, 36 shillings for three years. All other countries \$3.00 a year; \$6.00 for three years. Entered as second-class matter August 29, 1936, at Post Office at Albany, N. Y., under the act of March 3, 1879. Printed in U. S. A. Copyright 1943 by McGraw-Hill Publishing Company. Cable address: "McGrawhill, New York." Member of A. B. P. Member A. B. C.

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# Scrap a pound and save 4 more

**E**ACH pound of scrap used in making war steel replaces a pound of pig iron.

To make one pound of iron requires nearly four pounds of ore, coal and limestone.

So when you turn in a pound of scrap you also conserve four pounds of vital raw materials. Translate this saving into terms of the 6,000,000 tons of steel scrap that the industry needs today. It is the equivalent of:

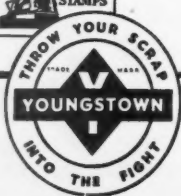
12,000,000 tons, or 240,000 carloads of iron ore,

7,200,000 tons, or 144,000 carloads of coal,

3,000,000 tons, or 60,000 carloads of limestone.

Think also of saving the millions of man hours of labor involved in mining, transporting and processing these 444,000 carloads of raw materials — enough to form a solid train stretching from Boston to San Francisco.

The more dormant scrap YOU salvage, the greater the amount of America's materials, machines and manpower is released for the all-important task of winning the war now.



**THIS ADVERTISEMENT SPONSORED BY  
THE YOUNGSTOWN SHEET AND TUBE COMPANY  
Youngstown, Ohio**

25-43E

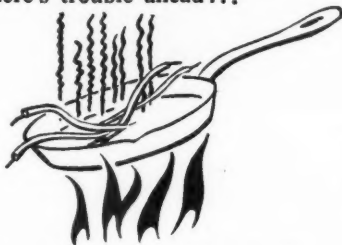
# Plan for a Long War- Work for a Short One!



**M**AINTENANCE "as usual" went out with Pearl Harbor. Today, every U. S. maintenance man knows he's pitted against a Jap or Nazi maintenance man. He's got a man-sized job...



For example, if the current in a motor exceeds its nameplate current rating, heating may increase as much as the *square* of the current increase! And when a motor runs a fever, there's trouble ahead...



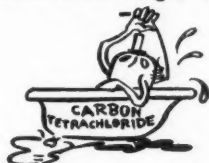
Excessive heat can "fry" the life out of insulation, melt soldered connections, burn out bearings. That's why a close eye must be kept on every motor's overload protection.



Friction is another dangerous source of heat — so the right lubricant in

No one can say how long this war will last. But maintenance can say how long America's motors will last...and how efficiently they will work to help shorten the war!

the right amount must be kept *in* bearings and dust must be kept *out*! For cool-running motors, dust must be kept out of windings, too...



If compressed air or suction doesn't get the dust out, it's necessary to give the dirty motor a "bath". Promptly, too — because the rim travel of a rotor in many motors today is round the world *every eight days*...



Some job to keep motors rolling at that rate — for the duration!

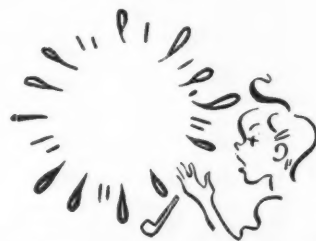


Just as "rutting" is fought in road maintenance, "grooving" must be fought in *motor* maintenance. Some

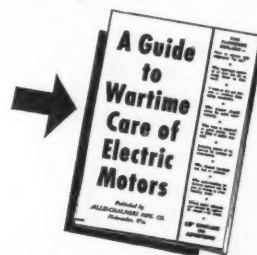
wear is inevitable on slip rings and commutators, of course. But *smooth* and even wear is slow wear!



"Keep oil where it belongs" is a basic rule in maintenance. Once outside bearings, it attacks any insulation it reaches. *Inside* bearings, oil must be protected against misalignment pressures...



The oil film guarding a bearing often is no thicker than the wall of a soap bubble...can fail just as suddenly — and completely!



For the full story of what *today's* maintenance should be, send for your free copy of "A Guide to Wartime Care of Electric Motors." It's fully illustrated (with the sketches above and many more), practical, complete. ALLIS-CHALMERS MFG. CO., MILWAUKEE, WISCONSIN.

A 1553



## ALLIS-CHALMERS

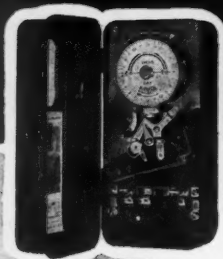




# Guarantee

PROTECTIVE

DEPENDABLE OPERATION OF  
FLOODLIGHTING WITH  
AUTOMATIC CONTROL



## SANGAMO TIME-SWITCHES

### DURING BLACKOUTS

**D**URING any current interruption, as for instance when a master-switch is pulled for a temporary black-out, Form VSWZ Astronomic Dial Time-Switch will continue to run for ten hours. An automatic carry-over feature provides for clock-spring operation when the current is off. The clock-spring rewinds automatically when the current is restored, and the time-switch resumes its normal synchronous operation.

**M**ore important than ever before, protective floodlighting installations for factory yards, building approaches, railroad sidings, and other vital property serving in war production, need the full automatic control provided by Sangamo Time-Switches. With this control the factor of human error is eliminated and lighting is operated when, where, and as long as it is wanted. Choose from the complete Sangamo Line, which includes astronomic dial, synchronous carry-over, and outdoor time-switches.

**SANGAMO ELECTRIC COMPANY** **SPRINGFIELD ILLINOIS**



# Don't WASTE MAN-HOURS AND CRITICAL MATERIAL Building Special Enclosures

...there's a **STANDARD**  
G-E combination starter  
to meet every operating  
condition



## FOR HAZARDOUS LOCATIONS

The Type 7 case for Class 1, Group D, locations is made of cast, high-strength alloy. These starters can withstand internal explosions. The flanges, which are securely bolted on all sides, are ground to tolerances that will not permit the escape of hot gases.

## WATERTIGHT

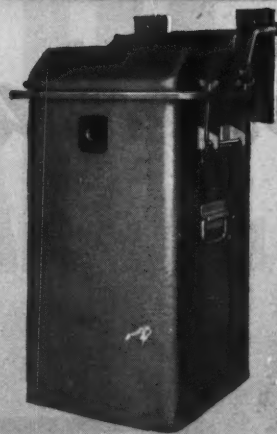
The Type 4 case is suitable for outdoor use, and for installations in damp places indoors, such as in dairies and breweries.



The Navy "E", for Excellence, has been awarded to 72,780 General Electric employees in its plants manufacturing naval equipment.

## CORROSION-RESISTANT

These starters (Type 8) are made in two forms—one for corrosive atmospheres and one for hazardous locations. All their arcing parts and terminals (for use in hazardous locations) are at least six inches under oil.



## GENERAL-PURPOSE

The Type 1 enclosure is suitable for general-purpose, indoor applications where atmospheric conditions are normal.



## DUST-TIGHT

The Type 5 enclosure is for use in steel mills, cement mills, and other locations where the dust content of the atmosphere is so heavy as to make a dust-tight case desirable. The cases are of heavy sheet metal, equipped with heavy gaskets, clamping bolts, and wing nuts.

## Order STANDARDS to save time and material

**N**EVER ENOUGH production time—scarce material urgently needed! Both far too valuable to be spent in building unnecessary control rooms and special enclosures.

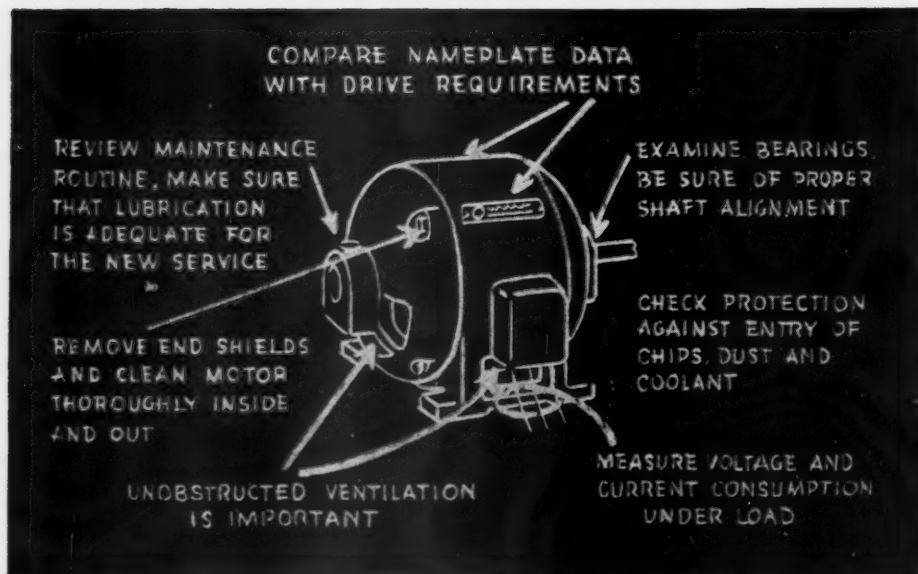
But delivered-ready-to-install control isn't all that the General Electric line of standard combination starters offers you.

These starters combine two devices—a fused motor-circuit switch and a magnetic starter—in one compact unit. This saves you one complete mounting job. They come to you completely wired and ready to install—saving all the time and material needed to wire up two individually mounted controls.

If you wish, our local sales engineers will help you select the proper starter for your job from this standard line of G-E combinations—for a-c motors up to 200 hp. *General Electric, Schenectady, N. Y.*

**GENERAL  ELECTRIC**

# it's time to be a crank about



## protect your production with this maintenance plan

*Planned* motor maintenance, keyed to today's loads and conditions, saves vital hours of production time by forestalling future breakdowns and delay. In replacing hit-or-miss motor servicing with a regular schedule of *trouble-prevention*, you'll find real help in *G-E Motor Fitness Manual*.

The check list (right) tells what to do. The *Manual* tells how to do it, using well-proved methods that save time and help assure long-lasting motor service.

And, of course, your local G-E Motor Representative is always ready to aid you in putting these suggestions into practice, or in getting the new motors you may need for essential wartime jobs.

General Electric, Sec: H750-152  
Schenectady, N. Y.

Yes, send me a copy of "Motor Fitness Manual,"  
GED-1017.

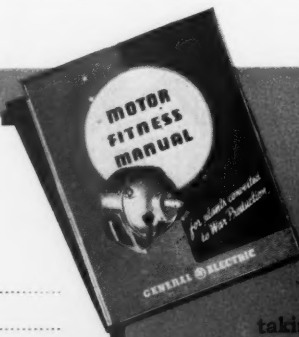
Name.....

Title.....

Company.....

Address.....

City..... State.....



## MOTOR FITNESS MANUAL

... for plants converted to war production. Tells what to do to get the most out of motors, old or new. If you're under-

taking new work on motor-equipped machines, if you're "switching" motors from one job to another, or equipping machines with new motors, you'll find this bookful of helpful motor facts will save you valuable time. Write for a copy.

# MOTOR CARE

## HERE'S WHAT TO DO!

1. Make sure that motors are selected to *match the job*. Install motors so they are properly aligned with the driven load and are easily accessible for regular inspection.

*The G-E Motor Fitness Manual tells how*

2. Keep motors free from dust and dirt. Establish a definite cleaning schedule.

*The G-E Motor Fitness Manual tells how*

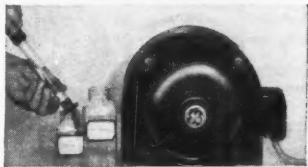
3. Be sure that lubrication is frequent enough to take care of increased production. See that employees are instructed as to proper methods. Also guard against over-lubrication.

*The G-E Motor Fitness Manual tells how*

4. A general overhauling of hard-worked motors will add years to their life. If your motors haven't had an overhaul in the last year, try to arrange your production schedule to permit one as soon as possible.

*The G-E Motor Fitness Manual tells how*

**IF YOU NEED NEW MOTORS** for important war work, check with your G-E Motor Representative on how to get Tri-Clad motors quickly.



The Navy "E", for Excellence, has been awarded to 92,780 General Electric employees in six plants manufacturing naval equipment.

BUILDER OF

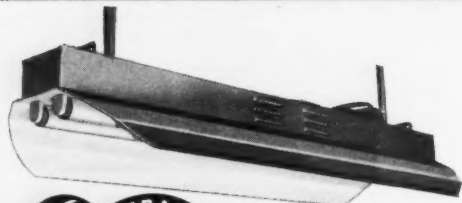
**TRI-CLAD MOTORS**

**GENERAL  ELECTRIC**

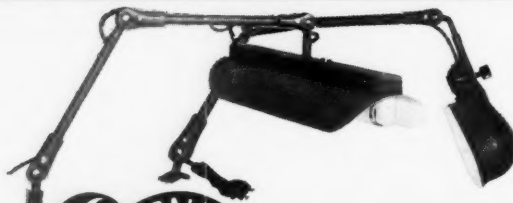




## VITAL "SEEING" for Men at Production

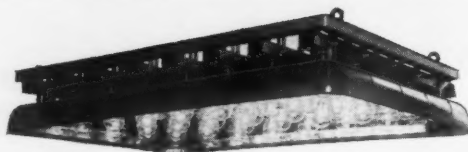


Good industrial lighting is the balanced combination of good general and good localized lighting. For maximum efficiency in "background" lighting, Fostoria Fluorescent Generalites provide definite operating advantages such as instantaneous starting, a minimum of noise, radio interference and stroboscopic effect, by elimination of need for starting switches. The time-saving for service and cost-saving for replacement parts are an important aid to wartime production.



Ideal seeing conditions demand that work areas be lighter than surrounding areas. Otherwise, eyes are attracted away from, rather than on the job. Fostoria Localites direct the right intensity of light on the job to provide proper balance with general lighting for maximum "seeing" efficiency. Thousands of war plants, served by progressive industrial contractors, are giving their workers this better "seeing" advantage today—and increasing production by it.

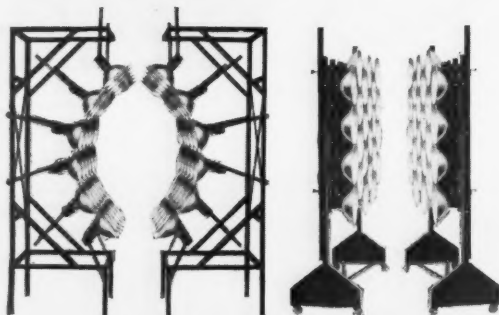
## VITAL SPEED for Baking and Drying



Of all the industrial processes developed in the past decade, Near Infra-red is outstanding in its aid to production and scope of present and potential usage. Its

amazing advantages in speed, space-saving and adaptability have been widely utilized and thoroughly proved in hundreds of war production plants.

The advancement by Fostoria of equipment for this process with extensive technical service has opened this vast new market to industrial contractors and contributed substantially to the war production effort. Now, and in the peacetime to come, Fostoria Infra-red process equipment will be in ever increasing demand by industry for speedy modernization of baking, drying, preheating and dehydrating operations.



Request full information, now, on these two vital first lines for electrical contractors.

**THE FOSTORIA PRESSED STEEL CORPORATION**  
FOSTORIA, OHIO



# Add Them to Your Check List of Safety Measures

✓ Steel Frames

✓ Light Traps

✓ Fire-alarm Systems

✓ Fire Walls

✓ Sprinkler Systems

✓ Pyranol Transformers

## ... Because Pyranol Cannot Burn

### FROM THAT ONE FACT SPRING MANY BENEFITS:

✓ YOU CAN INSTALL THEM INDOORS  
**SAFELY:** No Pyranol transformer has ever burned or contributed to a fire. Even if heat from a surrounding blaze ruptures the tank, the fire hazard will not be increased.

✓ VAULTLESS INSTALLATIONS ARE POSSIBLE: You can install them indoors or outdoors—in the basement, on the factory floor, on overhead beams, or on the roof. Such flexibility assures you major savings in time, floor space, and construction materials.

✓ PRIMARY POWER CAN BE RIGHT AT THE LOAD: Voltage regulation is improved,

line losses are lowered, copper is saved—often up to 30,000 lb in large industrial installations.

**AND BECAUSE THEY ARE LIQUID-FILLED THEY HAVE:**

✓ —A HIGH, LASTING DIELECTRIC STRENGTH—an important safeguard against damage from voltage surges caused by lightning and switching

✓ —PRESSURE-TIGHT TANKS, which protect vital parts from dust, dirt, and sabotage

✓ —A HEAT-STORAGE CAPACITY that is ideal for emergency overloads

**PYRANOL\*** transformers fit naturally into your wartime campaigns for (1) safety, (2) stepped-up production, and (3) conservation of critical materials.

The absence of fire hazard will help you with campaign No. 1. A reliable power supply, easily installed *where you want it*, is an important consideration for No. 2. Fireproof vaults being unnecessary, vital construction materials are saved. Since Pyranol transformers can be located at the load center, the runs of secondary copper are greatly reduced. These are important factors in helping you with point No. 3.

Since the introduction of Pyranol, in 1932, more than 4,000,000 kva of new transformers have been built using this type of cooling and insulating liquid. Hundreds of users are finding that Pyranol transformers assure the lowest total installed cost commensurate with the highest degree of safety.

Ask your G-E representative for the complete story, or write for Bulletin GEA-2048D. General Electric Company, Schenectady, N. Y.

\*Pyranol is the G-E trade name for askarel.



The Navy "E" for Excellence has been awarded to 92,780 General Electric employees in six plants manufacturing naval equipment.



**NOT HOW BIG THE MAN...**

**BUT HOW LARGE HIS SHADOW**

**W**ITH millions of dead and dying . . . the importance of the individual today would seem small indeed.

Still, maybe the way to measure a man is not by *who* he is, but by *what* he does.

That makes quite some difference.

Take the men and women now at work in the MILLER plant. Day and night they are turning out torpedo parts, bullet jacket metal, Navy wiring devices, gauges, special aircraft parts, searchlights, convoy lights, lenses, special castings, and a multitude of other war goods.

We like to believe the shadow of

their usefulness looms large over the war world.

The work they are doing . . . essentially *precision* work with copper and brass and steel and aluminum . . . they do extraordinarily well. They do it by instinctive and developed skill, and by *tradition* . . . for MILLER has almost 100 years to its back in metal-working.

Today their metal craftsmanship is at your command for anything from a bushing to a modern continuous fluorescent lighting system . . . *if you, too, are working for Uncle Sam.* Tomorrow their skill will be available to everyone . . . with full benefit of all they are learning in the interim.

**MILLER . . . for precision work in metal**

**THE MILLER COMPANY, MERIDEN, CONN.** . . . rolling brass and phosphor bronze . . . fabricating parts and fittings of metal . . . engineering and manufacturing a complete line of lighting equipment . . . domestic oil burners.

VARNISHED CAMBRIC • RUBBER POWER CABLES • BUILDING WIRE • RADIO

WIRE • BARE WIRE • MAGNET WIRE • SERVICE ENTRANCE CABLE • CRESFLEX NON-METALLIC SHEATHED CABLE

# CRESCENT

## ANSWERED THE CALL

WIRE • SIGNAL CABLE • FLEXIBLE CORDS • LEAD-ENCASED AND PARKWAY CABLES • ARMORED CABLE



Long before Pearl Harbor we were in total production for Defense. Now we are in

*Total Production for War!*  
**CRESCENT INSULATED WIRE & CABLE CO.**

Ask Your Wholesaler For



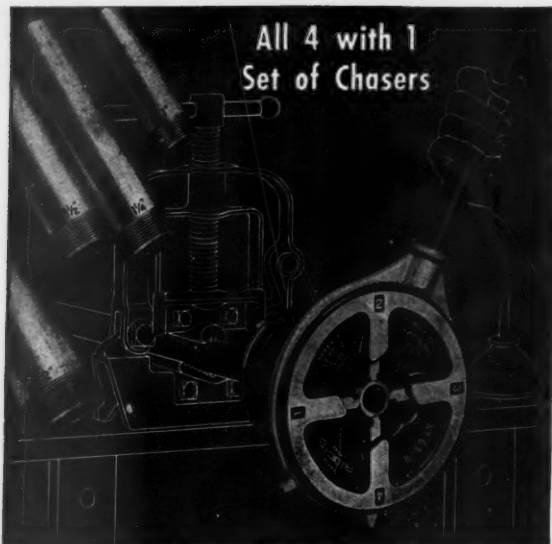
# CRESCENT

## WIRE and CABLE

Factory: TRENTON, N. J.—Stocks in Principal Cities

**CRESCENT ENDURITE SUPER-AGING INSULATION • WEATHER-PROOF WIRE**

Electrical Contracting, January 1943

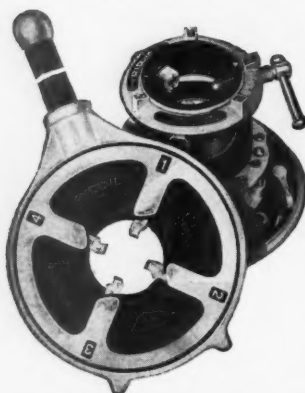


## *Perfect* THREADS

Faster and Easier with this self-contained

### RIDGID No. 65R

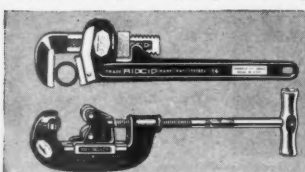
**T**HEADS you cut with this remarkable No. 65R are clean, sharp and of micrometer accuracy—in all 4 sizes, 1" to 2"—a new quality in a self-contained die stock. But you'll like also the easy floating cutting



No. 65-R, ratchet and plain, one and two handle, cam or plate type workholders.

action, the 10-second change to pipe size, the instant mistake-proof work-holder without bothersome bushings. It's a rugged steel and malleable tool with high-speed steel and chaser dies, assuring you long trouble-free service. It pays you to ask your Supply House for the RIDGID 65R.

All RIDGID Pipe Tools are sold through Supply Houses

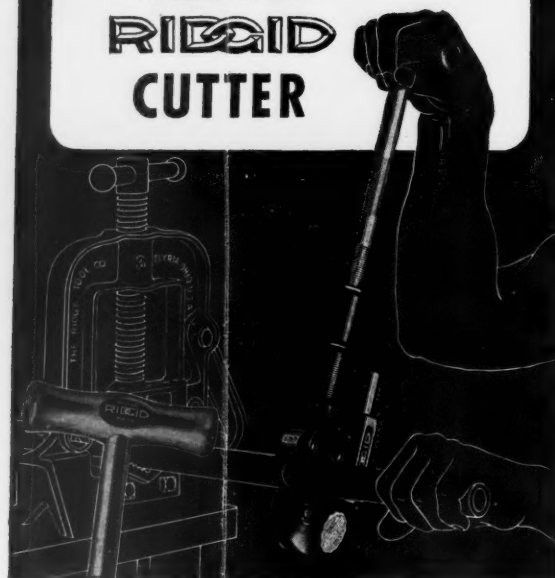


# RIDGID

★ PIPE TOOLS ★

*Fast-Working Tools for War... and the Busy Peace that's Coming*

When you cut pipe,  
*Cut Time and Work, too*  
with this  
**RIDGID**  
**CUTTER**



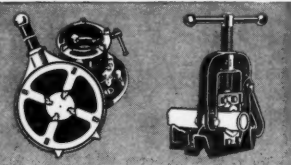
**R**EASONS why RIDGID Cutters roll more quickly and easily through pipe and conduit are in the design of the tools. The thin-blade wheel, for instance, coined from

tool steel and assembled in steel-bushed hub, makes an unusually speedy clean cut. Heavy-duty cutter frames are warp-proof, always cut true, are nicely balanced for easy work. 6 sizes for pipe from 1/8" to 6". Also No. 42, 4-wheel short handle for cutting in close quarters. Ask your Supply House.



RIDGID  
Tubing Cutter, with rolls—also cuts thin wall conduit.

THE RIDGE TOOL COMPANY  
ELYRIA • OHIO • U.S.A.







# GLASS

## Reflectors

**Make *Light* Work for Victory**

**Scientifically controlled lighting with "X-Ray"  
Silver Mirror Reflectors speeds up production**

**Less critical materials**

**Available now**

**Superior in efficiency**

**Low maintenance cost**

**Moderate first cost**

**Long life**

"X-RAY" Reflectors for industrial lighting are made of materials readily available now. They are practical, economical and trouble-free. Silver Mirror Glass is the most efficient reflecting surface used commercially. "X-Ray" Silver Mirror Reflectors are manufactured by the pioneer firm of lighting engineers whose background in the production of Silver Glass Reflectors extends over 45 active years.

A complete line of glass reflectors is available for standard incandescent lamps from 100- to 1500-watts, and also for the 400-watt Mercury Vapor lamp. The larger reflectors are designed for general high and low bay lighting, with smaller sizes for restricted areas such as shops, drafting rooms, and laboratories.

The Curtis representative located in a principal city near you is ready to help you with your lighting problems. For further information call or write him, or send your inquiry direct to the address below.

## **CURTIS LIGHTING, INC.**

6135 WEST 65TH STREET • CHICAGO, ILLINOIS



1943

# FIFTY YEARS

devoted exclusively to the design and manufacture of  
electrical equipment for circuit protection

★ SHAWMUT IS THE WORD FOR FUSES ★

*The Chase-Shawmut Company  
Newburyport, Massachusetts*

1893



# Electrical Contracting

With which is consolidated The Electragist and Electrical Record . . . ESTABLISHED 1901

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W. C. 2; Washington; Philadelphia; Cleveland;  
Detroit; St. Louis; Boston; Atlanta; Los Angeles. Member  
A.B.C., Member A.B.P. Publication Office, 99-129 North  
Broadway, Albany, N.Y. Editorial and Executive Offices,  
330 W. 42nd St., New York, N. Y.

A practical paper for electrical contractors,  
industrial electricians, inspectors, engineers  
and motor shops, covering engineering, installation,  
repairing, maintenance and management, in the field of  
electrical construction and maintenance.

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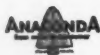
If you follow this free plan you not only help yourself, but more important, you help the war

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**NOTE:** Through this Preventive Maintenance Plan you may uncover the evidence necessary to obtain an "emergency repair priority." This is explained fully in the plan book.

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Anaconda Wire & Cable Company  
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Please send copy of the Anaconda Preventive Maintenance Plan for safeguarding production.

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1F



# Electrical Contracting

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## WHEN THE LIGHTS GO ON

The traditional canopy of colored lights downtown and the neighborly competition for the most attractive outdoor Christmas decorations were absent last month, by WPB order. Night shoppers in the populous coastal areas moved cautiously along darkened streets, the few lighted windows diffused and shaded by dim-out screens.

Trains are running with shades drawn, ferry boat passengers gaze around with bored stares, their newspapers folded. It's too dark to read. Signs are extinguished, street lights dim and windows curtained. The coastal dweller travelling to Cleveland or Denver finds brightly lighted thoroughfares strange and unreal.

Light, by its enforced absence, has become consciously important to the average American to a degree beyond anything that the combined effort of the electrical industry has ever been able to sell.

No instrument for creating "consumer interest" in lighting can compare with the dim-out. And one black-out sells a million lamps. This human reaction is primitive and powerful. It is curbed by rules and restrictions and intelligent public cooperation with the necessities of the war. But there it is waiting to be released. And one day it will be.

War work is absorbing practically all of the available energies of the electrical industry. It will continue to do so for a long time yet. But at the first break in the clouds, the first chance that we have to start building a post-war plan, the design for lighting a peace-time world must be drawn. And the great potential force of public demand can be harnessed and directed along the lines of industrial progress, social gain and the general welfare only if the electrical industry has the will and courage to take aggressive leadership, to subordinate special interests and to work in harmony.

The real sales job will be within our own industry. The lone wolves—the utility that wants new load through cheap wiring, the wholesaler who wants to sell "fixtures" by short-circuiting the contractor, the contractor who sees lighting only as an appendage to pipe and wire; the manufacturer who doesn't care much so long as he moves his line, the architect forever frozen to "four percent for wiring and fixtures"—all these must be brought to realize that their own special interests will be better served if they cooperate to do a thorough job of well engineered functional lighting.

If we can sell ourselves, the customers will be waiting. And they'll want good lighting.

---

JANUARY, 1943

# SAVE BUYING TIME ON ELECTRICAL ESSENTIALS

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Here's a plan that will help to mobilize the electrical supplies you need for war work with less difficulty and delay . . . a plan that can reduce the load on your purchasing department and plant engineers, saving office time and operating time.

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**THE THIRD STEP** is to consider how GRAYBAR's local warehouse and delivery facilities can tie-in more closely with your receiving department and stock-room operations. This may save space you badly need, eliminate trans-shipments and rehandling.

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**ONE HOUR** spent with your GRAYBAR Representative "dovetailing" this all-inclusive electrical supply service to your future needs may save hundreds of precious man-hours later on. Why not call GRAYBAR now for details on this MM Service?



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### \*Serving as Your MATERIALS MOBILIZER

...on electrical supplies, GRAYBAR makes its procurement experience a part of your war production facilities. In an emergency, GRAYBAR men at more than 80 points throughout the country will attempt to locate and bring together what you need to keep war production moving, to the full extent that priority and allocation regulations permit.

Executive Offices:  
GRAYBAR BUILDING  
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# Graybar

IN OVER 80 PRINCIPAL CITIES



# WHAT'S AHEAD

## IN '43

By W. T. Stuart

Projected prospects in the new year for electrical construction and maintenance and an analysis of the major problems ahead.

It is a tradition of publishing that each year we consult reams of accumulated statistics, notes from conferences with business leaders and Washington bureaus, and try to construct a clear picture of our industry in the year ahead. It's fascinating to watch the picture form. But no one can finish the job without a profound sense of pride in this industry, in what it has done and its obvious high destiny.

The men who design and install the wiring systems for power, light, communication, and control; those who apply and adapt electrical apparatus to war production and those who repair and maintain the whole complex mechanism are carving out a dominant place in the future of the electrical industry. The past year saw the greatest volume of electrical construction work of all time. It was handled on schedule. It was handled efficiently and competently by, in the most part, established electrical contracting organizations. The critical shortage of materials and the urgent necessity for keeping every machine running on 24-hour schedules meant an enormous responsibility to industrial electrical departments and contractors specializing in industrial maintenance. The job was done and is still being done quietly and effectively under increasingly difficult conditions.

So with a new year to project there is one unquestioned base line we can all count on—a strong, adaptable industry willing to tackle its share of battle.

Conservation order L-41 will continue to control construction through 1943. No tendency to relax its provisions are now apparent. Any changes that are likely to come will be minor amendments or administrative alterations.

In effect, L-41 restricts construction to war essential work that cannot be deferred. It places strict control in the hands of the Director of Industry Operations so that the construction work authorized will come within the available budget of materials.

According to a recent statement by Chairman Donald M. Nelson, of WPB, government financed construction will decline in 1943. Reaching a peak in August, 1942, military construction, munitions plants, war housing and public works are headed downward. The October total was estimated at \$1,473,000,000 compared with \$1,524,000,000 in September. The decline, according to Mr. Nelson, is expected to continue with the reduction reflecting chiefly the completion of projects and, to a lesser extent, cancellations or deferments designed to release materials and manpower for the direct production of munitions.

Again, apparently predicated on a constant acceleration of the war program, Secretary of Labor Perkins projects the decline in new construction through December 1943. She predicts that the monthly average of employment on publicly financed construction projects in 1943 will reach approxi-

mately 60 percent of the 1942 average.

These predicted declines are, however, from the enormous totals of construction employment recorded in the July-September period of 1942. The predicted monthly average for 1943 on publicly financed construction actually runs only slightly under the record for January 1942. Further, the estimates are based upon new construction only while the emphasis in providing housing and space for additional manufacturing capacity is turning to remodeling existing structures.

In electrical construction and maintenance work it is safe to predict some decline, a regression, however, lagging from 30 to 90 days behind the over-all construction decline and at a considerably slower rate as a result of the following factors:

1. Peaks of electrical work follow from 30 to 90 days after construction peaks.
2. The large cuts in construction costs through temporary designs and substitute materials cannot be accomplished at the same ratio in electrical work.
3. Recognized industrial lighting standards are on the upgrade and because of the important effect of light on production rates they cannot be reduced.
4. Progress in the electrification of production processes for speed, control and economy of labor is



# SCHEDULE A OF L-41

## Priority orders relating to construction

Preference rating order	Type of construction	Application forms	Where filed
P-14-a P-14-b	Shipyards and shipways	No form	Maritime Commission, Washington, D. C.
P-19 P-19-a	Buildings, structures and projects important to the war effort and essential civilian needs, other than housing.	No further application accepted under P-19 and P-19-a. Apply for P-19-b.	
P-19-d P-19-g	Publicly financed housing.	Application is made only by the Federal agency principally interested in the construction.	
P-19-e	Public roads	Application is made by or through the Public Roads Administration of F. W. A.	
P-19-h P-19-i	Buildings, structures and projects important to the war effort and essential civilian needs, other than War Housing.	Form PD-200	At the following places or such other places as may be prescribed: Residential (except farm dwellings): With field office of FHA having jurisdiction of the site. Agricultural (including farm dwellings): With Dept. of Agriculture County War Board having jurisdiction over location of the site. All other types of construction: With War Production Board, Washington, D. C.
P-41 P-55 P-55 Amended	Construction of air transport facilities. Private financed war housing.	(Expired Oct. 1, 1942). Form PD-105	With FHA field office having jurisdiction over location of site.
P-98-b	Construction related to petroleum enterprises as defined and limited therein.	See orders in M-68 series	
P-110	Remodeling of housing in defense area.	Form PD-406	With field office of FHA having jurisdiction over location of site.
P-130	Construction of certain facilities other than buildings by telephone companies, and Construction by such companies of facilities necessary to serve defense projects.	See order PD-685	With War Production Board, Washington, D. C., or such other place as may be prescribed.
P-132	Construction of certain facilities other than buildings by telegraph companies, and Construction by such companies of facilities necessary to serve defense projects.	See order PD-683	With War Production Board, Washington, D. C., or such other place as may be prescribed.
Certificates PD-3 and PD-3A.	Principally buildings, structures and projects owned or to be owned by the Army, Navy or certain other Governmental agencies.	PD-3A	With the contracting or procurement official having jurisdiction over the contract.

still in an upward direction further increasing the ratio of electrical work to over-all construction.

5. Remodeling existing housing for workers and existing plants for war work involves extensive changes in wiring system and apparatus.
6. Maintenance work is increasing rapidly as the supplies of replacement apparatus become more difficult to obtain.

## Materials and Men

In materials and manpower the present critical shortage will get worse be-

fore it gets any better. Both are so closely linked to the policy of the military and fluctuating requirements of the changing theatres of war that any forecast must be hedged against several probabilities. It is certain that no exact statement on the total number of men required for the armed forces will be made. It is equally certain, however, that the procurement program is set and that approximately as many men will be taken into the services in 1943 as have been enlisted or drafted up to this time.

So far, due to the extreme urgency of the construction program, skilled electricians on war projects have been deferred. The average age of experienced

electricians up to about 1941 was unusually high. However, an aggressive apprenticeship program and the high prevailing wages has attracted many younger men into the craft in the last two years.

During 1943 the armed services and the production industries will drain off much larger numbers of these men. Almost every piece of mechanical equipment going into the field is elaborately equipped with electrical devices. They must be repaired and maintained.

Good maintenance men are the product of natural skill and training leavened by years of practical experience with a wide variety of electrical trouble shooting. They must be drawn from our best young men. And during the coming year we can expect increasing rate of induction of such skilled men as equipment flows off the production lines to the fighting fronts in ever increasing quantities.

Replacements in construction and maintenance will tax our ingenuity. Upgrading skilled men to foremen or crew leaders over semi-skilled men and helpers may have to be resorted to on big projects. There has been some discussion about the use of women for routine industrial maintenance to fill shrinking staffs. There is every reason to believe that some maintenance routines—oilng motors, replacing lamps and maintaining lighting equipment—for instance, can be handled by women.

## Maintenance

The coming year will see a far greater concern in industry for the care, repair and maintenance of existing electrical equipment. The normal design allowances for overloads in motors has been cut by WPB orders. Motors must be applied on the basis of running at their actual capacity. Rather than change the nameplate characteristics, the orders are to adapt motors on the basis of about 125 percent of their nameplate ratings. While such economy is probably justified under our critical material situation, motor troubles will probably increase as a result.

Maintenance will continue to carry high priority ratings. Washington is fully aware of its importance in the over-all war plan. And its strategic importance far outweighs the relatively modest amounts of critical materials which must be budgeted. It is also a phase of the production problem that generals and admirals can understand thoroughly. The story of the horseshoe nail is part of our military lore.

With demands for new electrical apparatus and materials still going up, the War Production Board recently issued an appeal to industry to try to buy and

use idle and rebuilt motors before ordering new equipment. Under the new order the purchaser must certify in his order that he has no adaptable idle motor and that he has attempted to obtain a used motor.

This policy of reclaiming and using every piece of idle apparatus will be further emphasized as we enter the new year. We may expect more severe "use it or scrap it" rules in the coming months with a resulting load on our motor repair shop facilities. The rebuilding and repairing of used equipment for war work application and the accelerated wearing out of new equipment by the wartime policy of applying motors beyond their rated capacity will bring a large increase in industrial service shop work during 1943, with most of the business going to those shops which are best equipped by mass production methods and high speed machines to turn out the extra load of work with the least additional skilled manpower.

### Housing

In housing, the rules limiting the use of copper and steel allow a bare minimum of essential wiring. During 1943, it is unlikely that these limitations will be modified excepting in the direction of further restrictions.

Utility standards control the size and length of service drops and permit voltage of 105 to 125 volts or more than twice the conventional spread. Copper wire is permitted for service conductors; underground services smaller than No. 2 are prohibited.

The "Critical List" which became effective on December 12, specifies the number of permissible outlets in each area and limits metal-clad wiring to raceways imbedded in masonry or concrete. Rubber insulations are permitted only on wires in wet locations. Wire sizes must be the code minimum.

The critical list does not actually prohibit the use of other materials than those allowed but prohibits the use of preference ratings to obtain such other materials. The drastic need for housing in busy war plant areas will stimulate a continuing housing program through 1943 from both private and public funds with an increased emphasis on remodeling existing homes for multiple family occupancy.

### Standards

Speedy adaptation of the National Electric Code to the necessities of war has gone a long way toward preserving basic safety standards against the beating that all peace-time regulations are suffering. With steel, copper, and rubber on the "most critical" list, wiring

systems have been subjected to unusually careful study to find ways of economizing. The flexibility of the Code to meet special situations and the cooperative attitude of the Emergency Committee toward WPB have, however, resulted in a friendly reaction in Washington. The Code has acted as a check against over-enthusiastic limitations which might risk far more critical materials than they would save.

While downward revision of safety standards and compromises with materials scarcity are being handled with caution, it is safe to predict that fires of electrical origin will increase in the coming year. The recent Boston night club disaster and other less well known catastrophies over the country are re-emphasizing the importance of maintaining civil safety codes at the highest efficiency that wartime conditions will permit.

It is unlikely that major code changes are in prospect for 1943. Many supplementary revisions will be made to meet specific problems on a "duration" basis. Radical specification changes to cut down on metal-clad wiring will go on, but the alternative wiring methods will be within the Code.

### Post-War

Beyond the immediate problems of setting up and speeding the production machinery of war, electrical industry men are thinking here and there of the days of peace. What will they bring? And what can we do about it now?

It is still too early, perhaps, for an

over-all plan of industry development in the post-war world. But certain specific plans and objectives are already apparent and in some concrete form. There is a remarkable unanimity of opinion among manufacturers and contractors on certain courses that the industry will take and they are worth outlining here as the basis for further discussion.

1. It is reasonably certain that post-war industrial conversion to peace-time products will adopt more elaborate electrical systems than ever before. Electronic controls and process heating by induction and radiation have proved highly successful in war plants. They will be widely adapted for peace-time manufacturing with a consequent increase in industrial wiring and apparatus. Lighting levels will go up still further.

2. Commercial lighting will follow a functional approach to the lighting problem, away from "fixtures" and toward inbuilt lighting designs tailored to the sales activity or office work to be done. Air conditioning will be essential to post-war commercial activity.

3. Residential lighting will be revolutionized and the home builders budget for wiring and lighting upped to a level that few had the courage to predict a few years ago. Fluorescent lighting built into ceiling panels and coves to provide high level illumination without brightness will probably be the first approach to functional lighting in new homes.

These are individually large markets for our industry. Tied into an over-all post-war plan they become a challenge of enormous importance to all of us.

ESTIMATED EMPLOYMENT ON NEW CONSTRUCTION  
IN THE UNITED STATES 1942 AND 1943<sup>1</sup>  
(Thousands of Persons)

	Month	Total	Public	Private
1942	January	1,761	795	966
	February	1,661	803	858
	March	1,727	921	806
	April	1,884	1,078	806
	May	2,098	1,228	870
	June	2,289	1,394	895
	July	2,404	1,549	855
	August	2,413	1,675	738
	September	2,242	1,571	669
	October	2,042	1,438	604
	November	1,828	1,299	529
	December	1,630*	1,181	452
1942 Monthly Average		1,999	1,245	754
1943	March	1,255*	960	295
	June	1,125*	810	315
	September	855*	565	290
	December	550*	370	180
1943 Monthly Average		1,040*	750	290

<sup>1</sup> Employment as presented covers wage earners, salaried workers and special trade contractors actively engaged in construction.

\* Projected.

FIRST STEP—parallel lengths of wire from ten rolls of cable are stretched on the table and cut to length. The ends are cleaned for connections.

**S**HOP assembly, used so much in automobile and war-production industries, has found its way into electrical construction for war housing. Examples of it comes from all parts of the country, but none any more interesting than the method developed by A. R. Woolley, manager of the electrical department of Idaho Lumber & Hardware Co., Pocatello, Idaho, in the wiring of several thousand prefabricated, demountable homes near Ogden, Utah. Woolley has applied the pre-fabrication idea to electric wiring and saved manpower. What's more, he has speeded the job so that it keeps pace with the rapid assembly of the individual houses.

Under Woolley's system, 90 percent of the rough-in work is done in a specially prepared shop. First the non-metallic cable is rolled out over a table designed for it from a roller containing ten rolls at a time. Clamps designed to hold the cable on the table and a special cutter permanently attached to one end cuts the cable into the various lengths required, ranging from 2½ feet to 14½ feet in length. This table, manned by either two or three men, is the first step. The ends of the cable are stripped ready for insertion in junction or switch-boxes. As the various lengths are cut they are pushed to the opposite side of the table on rollers and dropped into suitable troughs.

These troughs are then transferred to special makeup tables where the assembly is made into complete circuits. A



## Shop Circuit

**Pre-assembled wiring circuits for prefabricated houses speed war housing near Ogden, Utah.**

journeyman electrician sitting at the makeup bench has within easy reach the ends of all the various lengths of wire required as well as all the various junction and ceiling outlet boxes. Without moving he takes a wire length leading from the service cabinet and makes up each of the various boxes, including all joints. He rolls his work away from him around a cable reel, controlled by a crank conveniently at hand. When the circuit is complete the removable end of the cable reel is taken off and the circuit thus wound is tied with a piece of tie wire and identified with a tag as to its particular circuit.

With two circuits to each house, two makeup tables are required, designated A and B. An A and a B circuit are sufficient to rough-in one house or one unit. Since the units are arranged both right and left, circuits are further classified as AR and BR.

In front of each makeup table there is a layout board which makes it easy for an electrician to follow his work as he goes along. This shows the lengths to use, whether two- or three-wire cable, and what connections to make. This results in very few mistakes.

All that now remains of the complete rough-in are the can for the service

**ELECTRICIAN BELOW** pulls in the wire and set the boxes in place.



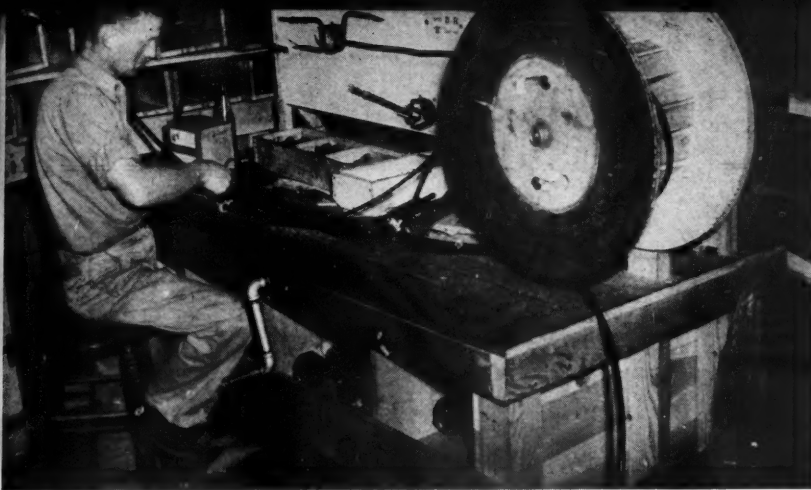
**ANOTHER ELECTRICIAN** finishes the outlet box and locks the supports.



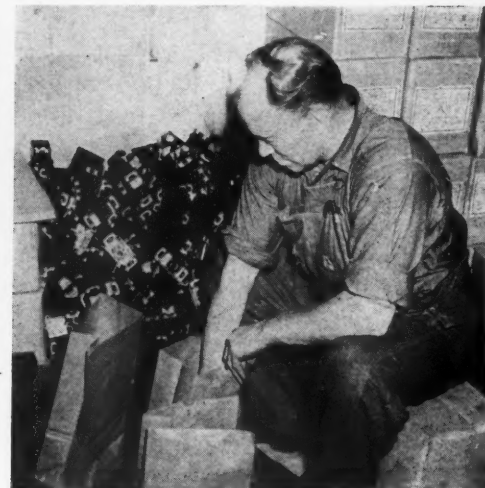
**PORCHLIGHT** outlet being installed. Wires are stripped for the fixture.







AT THE MAKEUP TABLE outlet boxes are affixed and connections made. The circuit is wound on the cable reel with a removable end then tied into a bundle.



SWITCH BOXES, breakers, ground clamps, entrance light and bathroom fixtures are stacked up ready to go with each group of circuits.

SWITCH LEGS are pushed down between the walls by means of the ramrod.

# Assembly

By W. A. Cyr

center, the switch boxes, and ground clamps. These are pre-assembled in paper bags and distributed along with the circuit to each unit.

In the field, since all devices have been prepared for installation in the shop, a field crew of three men can do the installation. The ears have been broken off of the boxes because of the plywood wall and type of box mounting to secure a good flush fit. Switches and receptacles have likewise been prepared and counted out. They have been loaded into special trays suitable for holding the devices for twelve houses or units which is a good day's work for one journeyman. Another journeyman precedes this with his tray carrying the service entrance equipment. It consists of the breaker, the cover, the lead-in cable, sill plate, etc.

Following the device man comes the fixture man. Fixtures have been previously unpacked, checked for completeness and proper fit of all component parts, and placed in the proper rooms in the houses by helper labor. The fixture journeyman simply hangs fixtures, which is a job that just about parallels the device job for time. The service job proceeds about twice as fast as the other two so one service journeyman can keep the two device men busy.

To install the circuits a journeyman unrolls one of the prepared circuit wiring assemblies. He works from above the ceiling. Here he places the outlet



boxes and rams the switch legs, or convenience outlet leads, down through the partitions with a ramrod made from a piece of  $\frac{3}{4}$ -in. electric metallic tubing cut in half lengthwise. This half-round shell rod has one end tapered into a blunt point into which a saw cut has been provided to catch the bare ends of the wire which are to be drawn down into position. All of the openings in the walls for switch boxes and bracket lights have been pre-cut at the mill. Therefore, the journeyman below simply attaches the switch box to the cable end, slips in place two "E-Z-In" switch box supports which he bends over to draw the box tight against the wall.

Woolley says the installation is done in about 15 or 20 minutes. "This means we can get on and off the ceiling between the ceiling crew and the roofers. This completely eliminates any interference with the builders and means we can wire a house without holding up

its construction." With a crew of eight journeymen and three helpers and a foreman he was finishing at about the rate of 20 units per day which was as fast as the painter was getting them ready.

Not the least important feature of this wiring method is its saving in materials. Since several lengths of wire are required from  $2\frac{1}{2}$  feet to  $14\frac{1}{2}$  feet, every coil can be cut without waste.

"About the hardest part of the whole scheme," Woolley said, "was in getting tooled up for the job. We had to make everything. Nothing of its kind was on the market. Our knife, with which we cut the wire, ten cables at a time, was a real problem. Claude Bristline, one of the owners of the company, helped with the design of this knife and the rather ingenious clamps we use to hold the wire ends. After we were all set to go we couldn't get material to start since a high enough priority had not been granted the job to buy wire. Our general manager, R. H. Wells, had to make two trips to Washington to get us lined up.

The first job was for 2,000 pre-fabricated homes and additional units of 1,400, 200 and 400 are being built by this method. They will be occupied by January by the fast-growing war production and other personnel of the many Army posts in that area.

# STEAMING OUT WIRE JAMS



PORTABLE STEAM GENERATOR used to help remove "frozen" conductors in existing conduits. Live steam hose is connected to the conduits by special fittings. Bottled gas is used as fuel.

**S**TUBBORN wires in existing conduits at the Chicago and North Western Railway Building, Chicago, were given a shot of live steam to loosen them up for extrication during rewiring and a changeover from direct to alternating current service.

When the Super Electric Construction Company, Chicago, took on the job of rewiring this 40-year-old office building to house U. S. Government agencies, they planned to use every available existing conduit in order to save as much critical material as possible. Their hopes began to falter when they ran into difficulty on a number of the branch circuits. The wires just would not budge.

They then took advantage of an offer by the Utilities Research Commission, Chicago, to use a new device developed by them as a result of studies made in the testing laboratories of the Commonwealth Edison Company, under the di-

**A portable steam generator broke the "frozen conductor" bottleneck in this office building rewiring job. Live steam injected into circuits loosened wires and permitted easy removal.**

rection of testing engineer E. D. Tillson. The apparatus was a portable steam generator designed for the extrication of wires which resist all other removal methods.

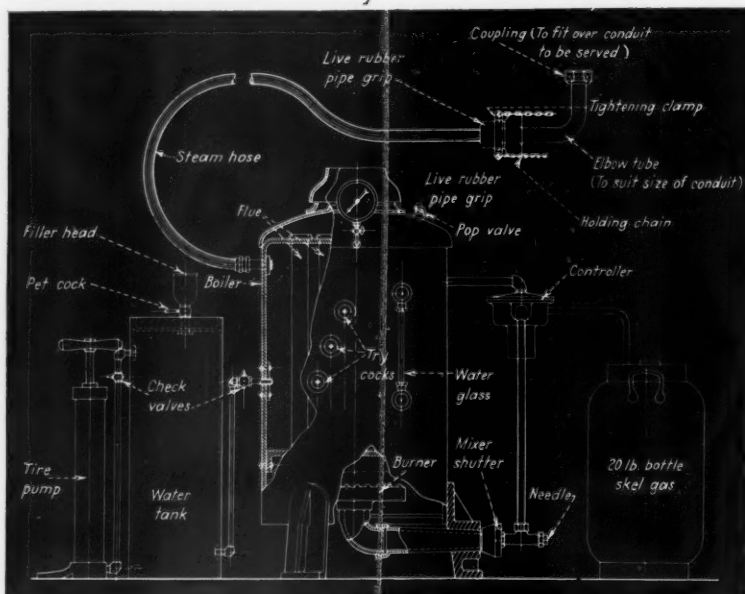
The unit, mounted on a hand truck for portability, embodies a small steam boiler with a supply of "bottled gas" to generate heat. It forces steam, under 60 pound pressure, through a flexible hose and special fittings directly into the conduit containing the "frozen" wires (see diagram). The combined effect of the steam and heat emulsifies the hardened wax and asphaltum on the conductor insulation, producing a lubricant the length of the conduit, which tends to loosen and ease the wires when they are pulled. Once the first wire is removed, others in the run usually come out easily. After the wires are removed, the conduits are swabbed and new conductors installed.

Used on 26 conduit runs, the device was successful in all but three—where

the conductors had apparently become welded to the conduit and resisted all attempts to dislodge them. Actual steaming time averaged about five minutes per duct. However, it took almost an hour to raise the required steam pressure. This "bug" is being eliminated by supplanting the original burner with a larger one capable of generating steam in a shorter time. Another improvement, resulting from field experience, is the addition of an auxiliary hand-type injector on the boiler. This is to be used for long, heavy cable runs and large diameter conduits which may cause the supply of steam to be exhausted before the wires become sufficiently heated.

Savings of critical materials on this specific wiring job amounted to 40 pounds of scrap copper which normally would have to remain in the jammed conduits and more than 400 pounds of steel that would otherwise have gone into conduit and fittings for new runs.

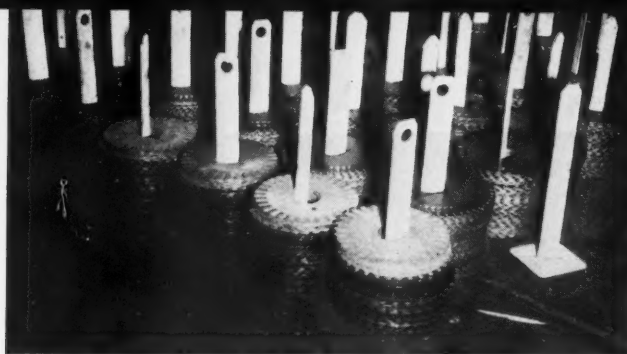
[Continued on page 91]



DETAILED DIAGRAM showing the component parts of the unit and how it operates. Bottled gas provides the heat to generate the steam in the boiler. Live steam under 60 pounds pressure is injected into conduits.



SHAFTS AND CASTINGS, machined by other subcontracting firms, come into the shop ready for assembly. Stacked within easy reach, they lead off the assembly line.



PRE-SORTED AND COUNTED as they come off the punch press, these laminations come into the shop stacked on metal stands. Each stand contains the correct number of stampings for a complete armature.

## Subcontract ARMATURE ASSEMBLY

How a motor shop, cooperating with other local manufacturers, assembled more than 600 motor armatures under subcontract to a large motor builder.

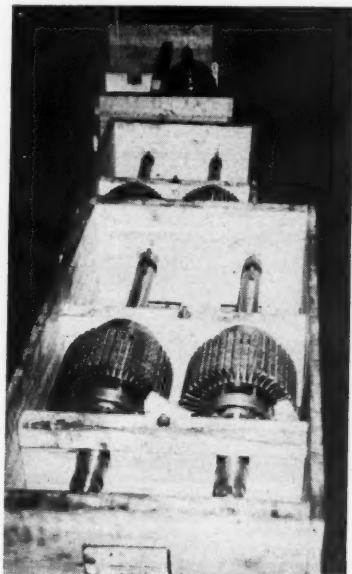
**W**HEN Independent Electric Machinery Co., motor service shop of Kansas City, Mo., offered its services, with about a dozen other local manufacturers, to do subcontract work for our war effort, it obtained orders to make coils and armatures for the Westinghouse Electric and Manufacturing Company. The manufacture of 10,000 armature coils was han-

dled by Independent alone, since it had the facilities to do the complete job. However, the armature order was primarily an assembly proposition so far as the motor shop was directly concerned.

John E. Launder, president of Independent, farmed out the manufacture of the component parts of the armatures to other local cooperating firms. One made the armature stampings; a second, turned the shafts; a third made the end castings and so on. The motor shop took the parts and assembled them into complete armatures, balanced them and shipped them to the prime contractor.

To expedite the assembly operation as much as possible, John used a couple of simple tricks. One was to have the armature stampings sorted and stacked on small metal stands just as they came off the punch press. Each stand contained the correct number of laminations for a complete armature. During assembly the mechanic had only to grab a stand full of laminations and mount them on the shaft, eliminating sorting and counting time. The other expediency was to have his trucks make regular pick-ups at the plants, eliminating delivery delays of the armature parts.

PACKED FOR SHIPMENT in wood crates after final balancing has been made. Removable interior supports permit salvage of crates which are sent back to the shop for new shipments.



UNDER PRESSURE during final assembly stage, the laminations are subjected to 10,000 pounds pressure in a hydraulic press while end castings are locked into place.

From here on the assembly operation was relatively simple. One end casting was keyed to the shaft; the laminations tapped on one by one; then, the second end casting was mounted and with the entire armature assembly under 10,000 pounds pressure in a hydraulic press, keyed into place.

After assembly, each armature was checked on a static balancing machine. To obtain perfect balance, excess metal was drilled out of the rim of the ends.

Shipments of the assembled armatures was made in wood crates equipped with removable interior supporting blocks and extended side arms for easy handling. Each crate, accommodating two armatures, was returned to the shop empty to conserve labor and material.

Although considered primarily a service industry, motor service shops can, when called on, do a certain amount of manufacturing and assembly work. Under our present emergency production load they can take a substantial part in our all-out effort.



## BOOSTERS INCREASE

By A. E. Smiley

*A. E. Smiley & Co., Electrical Contractors*

and

M. A. Havenhill

*Illuminating Engineer, Kansas City Power & Light Co.*

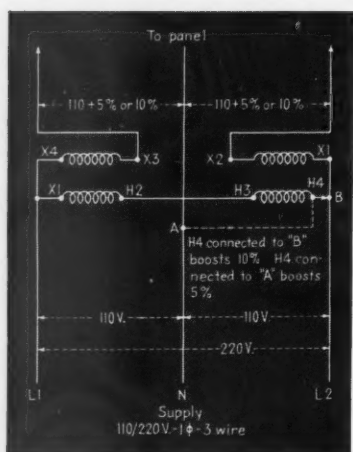


DIAGRAM 1—For a single transformer installation on 110/220 V., single-phase, 3-wire system. Terminal H4, when connected to phase leg at B will boost 10 percent; when connected to neutral at A, will boost five percent

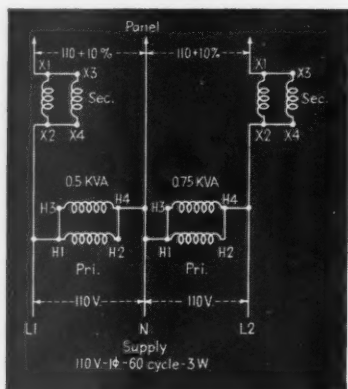


DIAGRAM 2—For two transformers connected to a 110/220 V., single-phase, 3-wire system, similar to that illustrated in accompanying photograph. Connection provides a 10 percent boost.

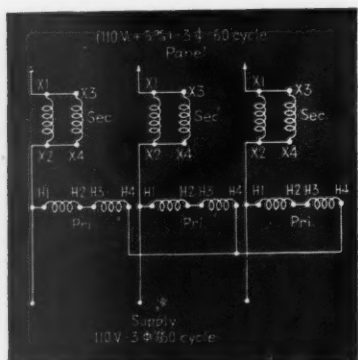
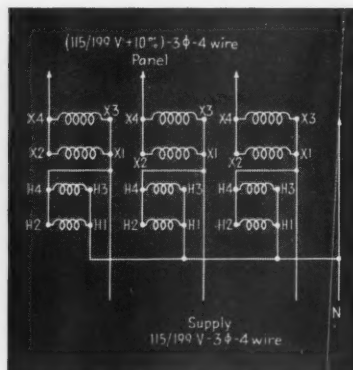


DIAGRAM 3—Connections for three transformers to provide a five percent boost on a 110 V., 3-phase, 3-wire system. One unit is in each phase of the line. Hook-up shown is for standard small air cooled units.



**DIAGRAM 4**—For a 115/199 V., 3-phase, 4-wire system, three transformers are connected as illustrated. This scheme gives a 10 percent voltage boost at the lighting panel or center of lighting distribution.

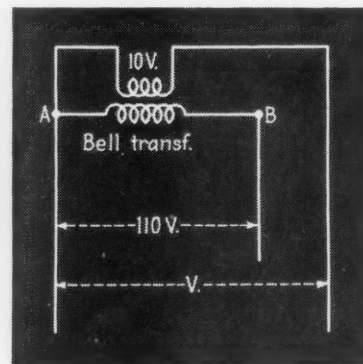


DIAGRAM 5—Illustrates the method of checking for polarity on a small bell ringing transformer. If "V" reads less than line voltage, transformer secondary connections must be reversed.

**W**HEN fluorescent lighting first came to Kansas City, it brought the numerous operating and installation problems that always accompany a new type of equipment. Prime among these problems was that of operating voltage at the lamps. Designed for a range of 110-125 volts, the lamps would flicker and go out if the voltage dropped below the lower limit. Numerous complaints arose, first from the corner drugstore where fluorescent made its debut, from commercial and office buildings, then from industrial plants. Contractors were called back to remedy the trouble and the utility lighting engineers were consulted.

Lighting engineers and contractors banded together to lick the problem once and for all. Investigation revealed that in most of the cases voltage drop in poorly designed wiring systems was the inherent cause of the flicker. After the voltage was checked a booster transformer test unit, used to show the effect of low voltage on industrial lighting systems, was connected in the circuit and the results observed. With a

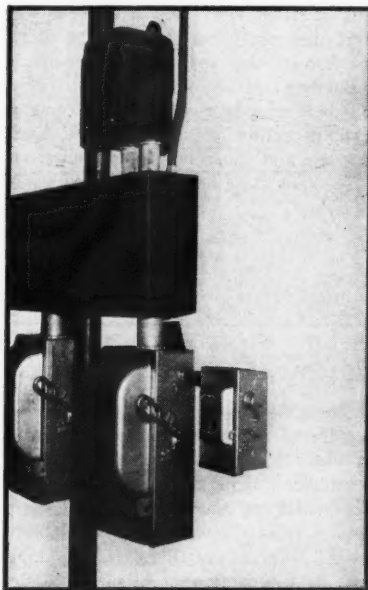
voltage boost the fluorescent lamps went on quicker and stayed on without any signs of a flicker. Here, then was the answer to the problem. The booster also solved the problem of fluorescent lamp operation in refrigerated show cases and cold storage areas. With the lamps operating at the upper bracket voltage of the rated range, little trouble was experienced in cold operation.

Through the Adequate Wiring Section, Kansas City Chapter I.E.S. contractors and engineers soon learned the how and why of booster operation. From that time to the present there have been relatively few fluorescent lighting units installed in the Kansas City area without booster transformers in some portion of the lighting circuit. At present, three different methods are employed in booster installations:

1. *At The Lighting Service*—In numerous cases, particularly in stores and small offices, where the lighting load is not too great, the boosters are mounted at the lighting service and directly ahead of the lighting distribution panels.

# FLUORESCENT EFFICIENCY

Fluorescent lamp interruptions and inefficient operation are eliminated in Kansas City by booster transformers which increase the circuit voltage to lamp operating values.



**SINGLE BOOSTER** of 1 kva. rating provides a 10 percent boost at the split bus lighting panel at the Graybar Electric Co., Kansas City. Upper half of panel feeds fluorescent lighting; lower half, incandescent system.



**TWO UNIT installation** at the lighting service of the Gustin-Bacon Co., Kansas City. The 0.5 kva. transformer at left and the 0.75 kva. unit at right boost voltage 10 percent on the 3-wire system.



**SIDE OF PANEL installation** of a 1 kva. transformer provides a 10 percent voltage boost to the fluorescent lighting at the Firestone Tire and Rubber Co. building at Kansas City. Unit was added to existing panel.

quired can be calculated from the following formula:

$$\text{KVA of Boosters} = \frac{\text{Number of 40-watt lamps} \times 50 \text{ watts} \times \frac{10}{100}}{1000}$$

Where: the "50-watts" is the total current drawn by a 40-watt lamp and its auxiliary and the fraction  $\frac{10}{100}$  is the 10 percent boost in voltage desired.

To illustrate let's assume a fluorescent lighting load of 20 units, each with four 40-watt lamps. Then—substituting in the above formula:

$$\text{KVA of Boosters} = \frac{20 \times 4 \times 50}{1000} \times \frac{10}{100} = 0.40 \text{ kva.}$$

The standard size of transformer used would be 0.5 kva.

Although only a five percent boost might be necessary on some systems, it has been proved more economical to install a transformer with a five percent and 10 percent tap and of sufficient size to handle the 10 percent boost. When added voltage is needed, only that tap must be changed. The general idea is to raise the circuit voltage to the upper brackets of the 110-125 volt lamp operating range.

A good rule of thumb is to figure the booster size as 10 percent of the total

(Continued on page 72)

2. **At The Lighting Distribution Panel**—Where there are numerous subfeeders and lighting distribution panels in the system, boosters are mounted at the distribution panels and directly ahead of the branch circuits. Here, the voltage boost is not decreased by the drop in the heavier subfeeders to the panels and is applied directly to the branch circuits where it will do the most good.

3. **Split Panel Operation**—Some lighting systems include both incandescent and fluorescent units. In some cases the lighting distribution panels are split at the busses and the booster connected to that portion of the panel serving the fluorescent circuits. In others, separate

panels are used.

4. **At The Lighting Unit**—Where the fluorescent lighting load consists of one or two units in individual offices or work rooms, small 10 watt bell ringing transformers are connected to the lighting fixture. In many of the units there is ample space either in the canopy or the wiring channel to mount this small transformer.

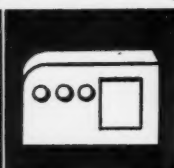
## Determining Size of Booster

The first step in determining the size of the booster and the additional voltage needed is to check the load and voltage of the lighting system. Once this data is at hand, the size of the transformer re-

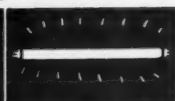
\$100,000,000



15 yrs.



5 yrs.



3 yrs.

FLUORESCENT LIGHTING reached the 100 million dollar mark faster than our great mass production industries. It took 15 years for cars and 5 years for radios to reach this volume. Fluorescent lighting hit the mark in three years.

## Industrials Prefer Fluorescent

A factual survey on what 2662 industrial users think about fluorescent lighting.

By B. K. Wickstrum

Lighting Division,  
Sylvania Electric Products Inc.

**I**n spite of the rapid growth of fluorescent (or perhaps because of it) little accurate research has been undertaken with the idea of developing figures to show the present saturation and potential future market for fluorescent among industrial plants. True, many guesses have been offered regarding the potentials of fluorescent both in industry and commerce. And many estimates have been made on the percent of industry and commerce now utilizing this new light source. But few dependable figures have been available that could be used as a working basis.

Recently, however, we completed a survey which revealed for the first time, to our knowledge, certain basic facts about the use of fluorescent lighting. And because the results of this survey proved so interesting to us, we believe they will be equally interesting to others concerned with the future of fluorescent lighting.

A questionnaire went to approximately 13,000 industrial plants rated \$125,000 or over and every effort was made to secure a representative cross-section of American industry as represented by its larger plants. Companies working on war production were included, and those which were not yet converted or could not be converted to war work were on the list as well. Steel mills and stove factories, chemical companies and shoe manufacturers, paper mills and wire mills—all these and hundreds of others were asked to cooperate.

The first question tried to find out what kind of lighting these manufactur-

ers now use—and if they use more than one kind, it asked them to make a rough estimate of how the types were divided. Of the more than 2500 manufacturers answering this question, 1714, or 67.3 percent, had some fluorescent lighting—32.7 percent had all-incandescent installations.

We believe these percentages are astonishing in themselves—when you consider the relatively few years that fluorescent lighting has been available. For these figures show that almost seven out of 10 manufacturers are now using some form of fluorescent lighting. A further breakdown of the figures shows that of all the manufacturers replying, 14.1 percent have converted more than 50 percent to fluorescent, and 22.1 percent have converted more than 40 percent of their lighting to fluorescent. In other words, approximately one manufacturer in every five has almost half or more than half of his lighting installation in the form of fluorescent. Of the total answers, five percent, 128, reported that they had some form of mercury vapor lighting in combination with fluorescent or incandescent lighting.

### Are Users Satisfied?

The second question in this survey endeavored to find out whether or not manufacturers were satisfied with the present lighting system. Three boxes were available for checking the answer

INDUSTRIAL USERS report on lighting shows marked preference for fluorescent.

to this question—"Yes", "No" or "Undecided". By relating the answers to this question with the answers to the first question, it was possible for us to breakdown the answers and compare the percentage of satisfied users having 100 percent fluorescent, those having a combination of incandescent and fluorescent, and those having incandescent only. The table below shows this comparison:

Are You Entirely Satisfied	100% Fluorescent Installation	Combination Fluorescent and Incandescent	Incandescent Only	Total Replies
Yes	92%	50%	64%	55%
No	2%	38%	29%	35%
Undecided	6%	12%	7%	10%

These figures give a very interesting picture of the almost unanimous satisfaction which 100 percent users have for fluorescent lighting. 92 percent replied with an unqualified "Yes", only two percent answers with a definite "No". We believe this extremely high rate of satisfaction is a tribute to the enormous strides made by fluorescent manufacturers who, in just a few short years, have brought fluorescent to a remarkable state of efficiency.

The next question asked, "Are you considering any change in your present lighting?" And it went on to explain

[Continued on page 72]

ARE YOU ENTIRELY SATISFIED WITH YOUR PRESENT LIGHTING?	YES	NO	Undecided
100% FLUORESCENT INSTALLATION	92%	2%	6%
COMBINATION FLUORESCENT AND INCANDESCENT LIGHTING	50%	38%	12%
INCANDESCENT ONLY	64%	29%	7%
TOTAL REPLIES	55%	35%	10%

# REPORT ON ORDER FOR ELECTRICAL CONSTRUCTION WORK

As required by Maximum Price Regulation No. 251  
(Within 10 days of entering into the contract)

To: Office of Price Administrator  
20 N. Wacker Drive, Room No. \_\_\_\_\_  
Chicago, Illinois

Date: \_\_\_\_\_

## A. REPORTING FIRM

Name \_\_\_\_\_ Address \_\_\_\_\_  
Reporting Official \_\_\_\_\_ Title \_\_\_\_\_ Telephone \_\_\_\_\_

## B. DESCRIPTION OF JOB (Item 1)

Purchaser: Name \_\_\_\_\_ Address \_\_\_\_\_  
Owner: Name \_\_\_\_\_ Address \_\_\_\_\_  
Project: Name \_\_\_\_\_ Address \_\_\_\_\_  
Nature of Work: \_\_\_\_\_

## C. ESTIMATED COSTS (Items 2 to 7)

2. MATERIALS (F.O.B. Job) ..... \$ \_\_\_\_\_
3. LABOR ..... \$ \_\_\_\_\_
4. DIRECT JOB COSTS
- A. MATERIAL
- (a) Sales Tax ..... \$ \_\_\_\_\_
- (b) (Eng., Design, Selecting, Etc.) ..... \$ \_\_\_\_\_
- B. LABOR
- (a) Insurance and Inspection ..... \$ \_\_\_\_\_
- (b) Supervision, Eng., Plans, Etc. .... \$ \_\_\_\_\_
5. ESTIMATED RESERVE FOR CONTINGENCIES AND GUARANTEE
- A. MATERIAL ..... \$ \_\_\_\_\_
- B. LABOR ..... \$ \_\_\_\_\_
6. ESTIMATED MARGIN
- A. MATERIAL ..... % + % on (2-4A-5A) ..... \$ \_\_\_\_\_
- B. LABOR ..... % + % on (3-4B-5B) ..... \$ \_\_\_\_\_
- C. TOTAL EST. MARGIN ..... \$ \_\_\_\_\_
7. THE CONTRACT PRICE ..... \$ \_\_\_\_\_

CONTRACT No. \_\_\_\_\_

SIGNED \_\_\_\_\_

FORM 1—WHITE ORIGINAL REPORT on an order for electrical construction work provides all the necessary data to comply with MPR-251. Information can be copied from estimate recap sheet.

FORM 2—GREEN FINAL REPORT on costs and margin for the electrical work originally reported on Form 1. Rider with additional information can be attached to this form.

**H**OW should reports of electrical construction work be filed to comply with the latest Maximum Price Regulation No. 251? The order states "The seller may file his estimate sheets or other working papers in lieu of the reports ....., provided that the required information is fully set forth therein." OPA men say these reports can be made on a company letterhead. Some contractors may file a copy of their estimate recapitulation sheets. And so the list of "possible methods" could go on.

To prevent confusion between the contractor and OPA, eliminate duplicate estimates, or inadvertent omission of information, the Electrical Contractors Association of City of Chicago tackled the job of providing a simple standard procedure for their members to follow.

In cooperation with the Chicago Office, OPA, they developed the two reporting forms illustrated. Both incorporate and are keyed to the information desired by OPA as set forth in Section 1397.57-b, items 1 to 7 inclusive, page 5, OPA Release "OPA-1018", dated Oct. 31, 1942.

Form 1, on 8½ by 11 white paper, is

# Reports For MPR-251

Forms developed by the Electrical Contractors Association of City of Chicago simplify estimated and completed job reports of lump sum work under Maximum Price Regulation No. 251.

## COMPLETED JOB REPORT

## REPORT ON COSTS AND MARGIN FOR ELECTRICAL WORK

As required by Maximum Price Regulation No. 251  
(At least 10 days before anticipated final settlement)

To: Office of Price Administrator  
20 N. Wacker Drive, Room No. \_\_\_\_\_  
Chicago, Illinois

Date: \_\_\_\_\_  
Date of Estimate: \_\_\_\_\_

## A. REPORTING FIRM

Name \_\_\_\_\_ Address \_\_\_\_\_  
Reporting Official \_\_\_\_\_ Title \_\_\_\_\_ Telephone \_\_\_\_\_

## B. DESCRIPTION OF JOB (Item 1)

Purchaser: Name \_\_\_\_\_ Address \_\_\_\_\_  
Owner: Name \_\_\_\_\_ Address \_\_\_\_\_  
Project: Name \_\_\_\_\_ Address \_\_\_\_\_  
Nature of Work: \_\_\_\_\_

## C. COSTS (Items 2 to 7)

- |  | Actual   | Estimated |
|--|----------|-----------|
| 2. MATERIALS (F.O.B. Job) .....            | \$ _____ | \$ _____  |
| 3. LABOR .....                             | \$ _____ | \$ _____  |
| 4. DIRECT JOB COSTS                        |          |           |
| A. MATERIAL                                |          |           |
| (a) Sales Tax .....                        | \$ _____ | \$ _____  |
| (b) (Eng., Design, Selecting, Etc.) .....  | \$ _____ | \$ _____  |
| B. LABOR                                   |          |           |
| (a) Insurance and Inspection .....         | \$ _____ | \$ _____  |
| (b) Supervision, Eng., Plans, Etc. ....    | \$ _____ | \$ _____  |
| 5. RESERVE FOR CONTINGENCIES AND GUARANTEE |          |           |
| A. MATERIAL .....                          | \$ _____ | \$ _____  |
| B. LABOR .....                             | \$ _____ | \$ _____  |
| 6. MARGIN                                  |          |           |
| A. MATERIAL ..... % + % (2-4A-5A) .....    | \$ _____ | \$ _____  |
| B. LABOR ..... % + % (3-4B-5B) .....       | \$ _____ | \$ _____  |
| C. TOTAL MARGIN .....                      | \$ _____ | \$ _____  |
| 7. THE CONTRACT PRICE .....                | \$ _____ | \$ _____  |

CONTRACT No. \_\_\_\_\_

SIGNED \_\_\_\_\_

Rider Attached: Yes \_\_\_\_\_ No \_\_\_\_\_

for reporting the original estimate as required and provides the necessary information for identifying the contractor, customer and project together with the total estimated costs. Direct job costs and reserve for contingencies and guarantee are broken down into material and labor classifications. The "reserve" item covers variables on the job caused by unforeseen labor and job conditions, weather, delays caused by deliveries and other trades and the mass of small items that crop up on construction projects. Margin is divided into a material and labor category with overhead and profit added to each to determine "total margin."

Form 2, on 8½ by 11 green paper is for making the completed job report. It is essentially the same as Form 1.

with the exception of two columns showing the comparison between actual and estimated costs. It also contains a notation at the bottom to indicate whether a rider is attached to the report. Such riders might prove helpful in providing a clear picture of the job and justifying any cost differences, either plus or minus, that might occur.

Such forms prove helpful in complying with MPR-251. The necessary data can be copied from the original recap sheet, permitting the contractor to retain his estimate intact with marginal notes and sketches. Delays, caused by lack of sufficient information, will be eliminated. And the OPA representatives will add their blessings, since standard forms of this type simplify their filing and reference tasks.



# Editorials

## Manpower Scarcity Is Acute

With all the talk of drafting manpower for civilian work, freezing jobs and the conflicts between government agencies, we are likely to forget that this whole manpower problem can be expressed in one simple statement. Our present war program indicates a net shortage ahead of approximately five million men.

Remove eight to 10 million men from the national productive economy, take many times this number for the basic job of supplying them with materials of war and the number left for the essential civil economy and industry is reduced to a number far less than we consider necessary for the job.

The scarcity can be made up in part by women who are pouring in increasing numbers into war industries. The scarcity can be reduced markedly by cutting down on accidents, illness and "time off". It can be further reduced by lengthening the work week, but according to the best data available it is unlikely that overall production increases significantly if the routine work week extends beyond 48 hours.

By any calculation, however, one of the most apparent results of the shortage will be sharply reduced civilian services. Whatever can be done to maintain those which are essential will be done, we can be sure. But the vitally important responsibility for using our available manpower to the best effect and with the greatest efficiency rests squarely upon our management resources.

For the past couple of years we have been generous in manning jobs, time was the essence and some wasted labor was far better than risking a delay. Now the effective use of manpower ranks as important as the time element. The hoarding of manpower

even on war essential work cannot be justified when we reach that new economic stage when there is nothing but essential activity.

## Food Is A Weapon

We don't have to resort to rhetoric or symbolism to prove the importance of food as a weapon in this war. It is a direct instrument in its own way for the conquest of the enemy.

Without considering the essential needs of our own civilian population or our armed forces in battle, food and food resources must still rank with guns, tanks and planes. It is being used to conquer and neutralize the civilian of occupied territory. It is offered as a potent hope to the people of those lands we shall use as stepping stones to Berlin.

But here at home we have classified the farmer in with the non-essential civilian activity. He has no preferred status to obtain the essential tools of agriculture and further electrification has been shelved for the duration. At the same time, war industry and the armed forces have drained off farm manpower to a point little short of a major disaster.

A manpower re-shuffling, deferring and freezing men on the farms will help. But another move that would still further speed farm production is obvious. That is, to give the farms an essential war industry status with some allocation of critical materials, especially those contributing to lightening the labor burden.

The application of electric wiring and equipment on the farms always had more than a social value. It could be justified on economic grounds. And it can now be justified as contributing most effectively to a total

war effort. Food is a mighty weapon. The plant that produces it ought to have the same access to essential electrical and mechanical equipment as other munitions industries.

## Disasters Write The Rules

The Boston night club tragedy which took over 500 lives will soon be buried in the statistics of national fire losses for 1942. Because that's the way technical men who are responsible for drawing up the rules and regulations for civilian safety keep track of such things. And here and there, unfamiliar new rules will appear in municipal ordinances to be fought over in committees and discussed by the effected industries on a high intellectual and logical plane. After a while there will come the usual protests about arbitrary rules stifling progress and of political machinations holding up costs.

The dead hands of those 500 burned bodies are writing new safety rules all over America. But the rules cannot be signed by the families of the victims, they cannot be annotated with the screams of the dying nor illustrated with pictures of the tragedy. They will be coldly impersonal, legal and abstract. They will deal with boring details of door construction and location and the chemical treatment of decorative materials. There will be no hint of the stark horror behind them.

The Boston tragedy has tightened up the enforcement of safety codes from coast to coast. It has, we hope, swept away some of the public indifference or cynicism toward fire prevention regulations including the National Electrical Code. Many of these rules, too, were born out of tragedies long forgotten. And if we can keep before us the importance of these abstract and impersonal regulations in preventing similar disasters, we shall be performing a public service as vital in war time as in the days of peace.

## Our Treasure Chest

The vital importance of our national scrap drive and scarcity of critical materials to our war effort takes on added significance when we stop to consider the vast flow of equipment

mechanized warfare demands. In World War I it was men and guns. Today, its tanks, planes, block buster bombs, invasion barges, warships, merchant ships and more ships, ack ack guns, and a host of other material needed to wage destruction—all made of metal.

The magnitude of our metal requirements today was strikingly brought forth in a comparison recently made before Chicago electrical engineers by W. V. Kahler, Chief, Construction Branch, Production Division, WPB. In 1918 the average amount of metal per man equipped was 94 pounds; today it is 4900 pounds—almost 2½ tons. Multiply that by the number of men in active service and you get a picture of what we are up against.

We've got to find means of salvaging everything we can and make our scrap collection a perpetual operation. It's the least we can do to keep our boys in fighting trim. This is really a war of metals, and what we considered a junk heap yesterday becomes the treasure heap today.

## And What's More

It's high time we quit this all too general "be glad to cooperate", high nosed attitude on this whole scrap situation. Job and shop scrap from electrical construction work belongs in "dormant industrial scrap", the most useful of all scrap sources. It isn't a job for some Thursday next week, nor it is a job for the third assistant water boy. It's an important responsibility for the boss—and today.

Obvious junk can be readily handled by the boys as routine, but the great untapped resources are those borderline tools, equipment and materials that represent some possible use. The disposal or repair and use of such materials and equipment needs an executive decision from the top man.

## Bright Side Up

Most of the time we watch the clash of special interests around Congress and the Administration with real concern. But an Administration official pointed out the bright side one day as he wound up an informal conference on a jocular note: The farmer, he

said, won't back down an inch from parity, labor won't give up its social gains and industry is unwilling to relinquish its profits. If our boys in the field are as unwilling to surrender their objectives, we'll win this war.

## Dim-out Accidents Are Increasing

War is a ruthless venture that must be planned to make the most of every resource regardless of the consequences to the personal comfort or convenience of either civilians or soldiers. Sometimes, however, apparently simple and essential regulations go beyond the hump of maximum war effort. The coastal dim-out is one of those rules which might be said to have reached the point of diminishing returns. It is claimed, for instance, that the increase in fatal and crippling accidents along the Atlantic Seaboard under the dim-out far exceeds the previous losses at sea from ships sunk against the sky glow.

This is a serious technical problem that must be solved without sentiment or favor. It does, however, indicate that the reduction of sky glow by permanently extinguishing and obscuring existing lighting is far from a satisfactory solution. There are too many accidents to important war workers.

By appropriate shielding, relatively good lighting on the streets and highways and entrances to buildings can be maintained without appreciable sky reflection. The expenditure in manpower and critical materials would be well worth the cost. And the over-all lumen output of a city to the sky can be balanced off by more drastic regulations on the shielding of windows.

## Light For Safety

When we talk about production lighting we are inclined to think of it simply in terms of more output or faster, surer, more accurate workmanship. The effect of good lighting as a safety measure to prevent industrial accidents is also important and should have appropriate weight in the design and layout of every lighting system.

Safety lighting in and around the plant is a job of intelligent application of the principles of good seeing. Whether the illumination measures 20

or 50 foot-candles is of less importance than the quality and direction of the light. The use of contrasting paints and strategic location of the light sources can often cut down stairway accidents. Two or three small unshaded lamps on the top and bottom of a shop elevator has reduced hoistway accidents. Supplementary lighting over a lathe tool rest or at points where machine adjustments are frequently made helps to eliminate crippling finger and hand injuries.

With three shift operation on war schedules the first principle of safety is a well lighted shop.

## Conduit Limits Not Drastic

The long expected order curtailing the use of rigid conduit, metallic tubing, flex and metal raceways for electrical work has finally been issued. The order, however, only officially sets up regulations on uses which have already been widely adopted in specifications and job practice.

A preference rating of A-1-j or better is now necessary to obtain any of the metallic enclosures. In practice it has been difficult to obtain job quantities of conduit with a lower rating for many months. Rigid conduit is allowed for hazardous locations and, in sizes 2½-in. to 6-in., where the wire and cables must be protected from mechanical injury or are installed in wet locations.

Electrical metallic tubing is permitted for wiring to production equipment or machinery when exposed to mechanical injury or for wiring imbedded in concrete or masonry. Flex may be used in short lengths for connections to motors or other apparatus from conduit or tubing. Raceways are under no special restrictions other than requiring an A-1-j preference rating or better.

The provisions exempt materials in possession of a contractor, at the job site, or in transit. They do not apply to used materials or to materials to be incorporated in implements of war.

Altogether the limitation order is very fair and in no sense endangers our safety standards. It must be remembered, however, that it represents a maximum specification. It is not a guarantee that adequate quantities of these materials will be available for every job.

# Methods

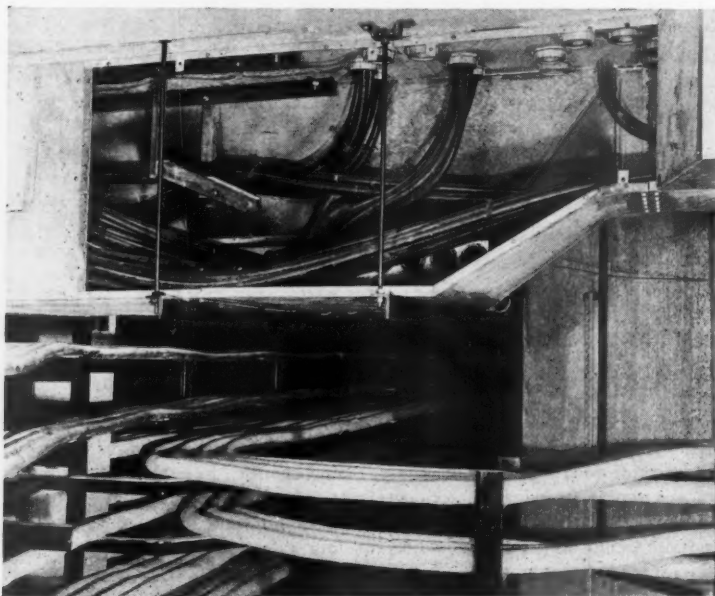
**BRIEF ARTICLES** about practical methods of installing and maintaining electrical wiring and equipment and up-to-date estimating and office practices. Readers are invited to contribute items from their experience to this department. All articles used will be paid for.

## A PULL BOX CABLE BRIDGE

—WIRING

A 40-foot steel pull box, tailor made to fit job conditions, was used by the Associated Electric Construction Company, to bridge fan and auxiliary unit feeders over generator cables in the underground electric tunnel at the Buick Aviation Engine Plant.

Extremely unorthodox in shape, the box was built to fit building construction and cubicle locations on the floor above. It is offset on three sides to receive various conduit runs and is equipped with a "blister"—offset—at each end to accommodate conduits which, of necessity, were out of line with the rest.



**UNIQUE CABLE TROUGH** serves as a bridge to carry auxiliary feeder cables across underground electric tunnel. The box, with offsets on three sides, was tailor made to fit building lines and to accommodate cables entering from all directions.

Because of its weight, the unit was supported by trapeze hangers mounted to the tunnel ceiling. To separate cross-overs of various cable runs, angle iron cable supports were installed inside the long box. One entire side of the box is composed of removable sections, giving complete access for cable pulling operations. Two sides of the "blisters" at each end are removable screw covers.

## CLEANING SALVAGEABLE PARTS

—INDUSTRIAL

A simple machine built from ordinary shop odds and ends cleans small salvageable lugs and machine parts in the



**CLEANING TUMBLER** uses buckshot and kerosene on dirty lugs, bolts and miscellaneous parts.



**SIEVE SEPARATES** cleaned articles from solvent and buckshot which falls through into the tray ready to be used again.

storeroom of the New York Power & Light Corporation. The method is equally useful in the contractors shop or the industrial maintenance shop.

The machine consists of a motor belted to a speed reducer which is in turn belted to the circumference of a drum. An opening in the side of the drum may be closed with a gasketed cover. The lugs or bolts to be cleaned are poured into the drum with a cleaning solution of kerosene and several pounds of buckshot. The drum is then sealed and rotated for several minutes.

The contents of the drum are then emptied into a sieve and tray, the oil and buckshot dropping through into the tray and the cleaned parts remaining in the sieve.

## ANGLE IRON VISE FOR CONDUIT ASSEMBLY

—WIRING

The John Miller Electric Co., Detroit, Mich., has come through with another gadget for speeding up electrical construction work. This time, its a

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# Power—Giant Arm of Production

*Ninety Per Cent of American Industry Is Electrified*

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**E**LECTRICITY is the mainspring that turns the wheels of our factories, mills and mines. It is the tireless arm that grinds our grain, weaves our cloth, pumps our water, builds our planes, our guns, our ships, our cars, our trucks and tanks . . .

The mighty Pharaohs had less energy at their disposal in building their pyramids than is generated today by one single power plant. The combined capacity of America's central power systems is without parallel in the history of the world . . . 46 million kilowatts, i.e., 65 million horsepower in steam turbines, hydro turbines and other prime movers. That is more power, day in and day out, than 650 million slaves could produce—for a limited time—minutes in fact.

The capacity of this vast fountain of energy is beyond the grasp of the average man who flips a switch and sets in motion machines that perform the labor of a thousand man-hours in a matter of minutes. Perhaps only the old time farmer, whose traditional source of power is a team of tired horses and a pair of calloused hands, knows how to appreciate this commodity that is so vital an ingredient of everything we consume and use.

Yes, we take electricity for granted. We expect it to appear in unlimited quantities, like water and air, as we need it. Almost as essential as these two elements in times of peace, it becomes a matter of life and death in times of war. Industry would collapse without it and the nation would quickly perish.

With the catastrophe of Pearl Harbor a little over a year ago, came the realization that we had to out-produce our enemies. To out-produce our enemies, who had a seven year head start, meant to turn more wheels than they were turning and to turn them faster than they were turning them.

New plants sprung up overnight. Production in-

creased beyond our wildest dreams. Aircraft and ship-building surpassed the most daring forecasts. The machine tool industry's output grew to a volume that bordered on the miraculous. Guns, shells, uniforms, shoes, tanks and a thousand other items were being made in hitherto undreamed of quantities. All of them have one common essential ingredient—power. Industry demanded power—more and more power!

It is no small tribute to the power industry that, while other raw materials developed shortages necessitating strict priorities control, electricity remains unrationed—no priorities, no curtailments, no rate increase. Current industrial consumption is running 16 per cent over 1941 and 50 per cent over 1940. Not spectacular perhaps but when we consider that the nation's 26 million domestic consumers utilize only about 14 per cent of the energy output, we begin to get some idea of industry's power consumption.

Our power companies might have been stunned by the prospect of mounting demands for kilowatts. Instead they set about developing and coordinating a multiplicity of relatively small and seemingly unrelated factors. Individually or even collectively, these have not been of a spectacular nature. Certainly they have not inspired the award of the Army-Navy E although they are an essential ingredient in every Army-Navy E that has been

*This is the seventh of a series of editorials appearing monthly in all McGraw-Hill publications, reaching more than one and one-half million readers, and in daily newspapers in New York, Chicago and Washington, D. C. They are dedicated to the purpose of telling the part that each industry is playing in the war effort and of informing the public on the magnificent war-production accomplishments of America's industries.*

awarded to American industry.

The contribution of the power industry to the winning of the war is not likely to flame forth in newspaper headlines. It takes the more prosaic turn of portraying an industry that is doing wonders quietly, unobtrusively.

At the close of the last war the power at the disposal of the American industrial worker averaged  $3\frac{1}{3}$  horsepower. At the beginning of this war, twenty years later,



it had increased to 6½ horsepower. What other nation can even approach that figure? This large provision of power is the achievement of the electric utility industry. For years it had built and applied its equipment to the highest standards of performance and operated its systems to equally high standards of service and dependability. Always recognizing that "public service is a public trust" it had maintained wide margins of security in performance. Today these margins are the source of the power industry's ability to rise to the emergency.

In short, the electric utilities were prepared!

Power men are accustomed to looking ahead, to prepare for growing loads and allow for unforeseen contingencies, for electricity cannot be stored. It is "ordered" by touching a switch. It is delivered and consumed at the same moment.

Months before the actual outbreak of hostilities foresighted power men set to work computing how much life of equipment could be risked in the process of crowding it toward greater output. Generators, boilers, turbines, cables, transformers and even conductors underwent close scrutiny in an effort to increase the load — safely. They figured, they experimented, they tried untried measures.

Insulation, for example, is the crux — the least known component of electrical apparatus. When it lets go the service suffers. It is not easy to know how near any bit of crucial insulation is to letting go. It takes courage to work it to a point just short of failure . . . but that is exactly what is being done today.

Technological forcing of equipment, however, is not all of the story. Obsolescent equipment has been rehabilitated; salvage has been intensified; critical metals have been replaced by non-critical materials; water sprays, air-blowers and other cooling methods have been installed to keep over-loaded apparatus from over-heating. Nothing has been overlooked. Ingenuity has contrived the well nigh impossible.

Hand in hand with these measures of expediency have gone measures of intensification. Hydrogen pressure for cooling generators has been stepped up from ounces to pounds taking more heat away from the machines and enabling them to carry greater loads. Capacitors — little more than aluminum foil interleaved with thin paper — have been applied by the carload relieving the systems of that mysterious reactive current which is associated with that equally mysterious power factor. They have performed wonders in avoiding the need for additional generating and transforming equipment. The use of portable sub-stations has averted the otherwise necessary reserve capacity in fixed installations at many points.

When coal was placed on the urgent list last spring

the electric utilities outstripped all other industries in providing storage for the winter. Stocks on hand the first of October were sufficient for 105 days, or more than twice what would be considered adequate in times of peace.

When staff losses to the armed forces became serious power companies contrived measures that enable them to get along without aggravating the national manpower situation by hiring others to replace them. Today meters are being read every two or three months instead of monthly; women are being trained to do drafting, keep the logs in power plants and sub-stations and to test meters in shops and laboratories.

On the summit of "Grandpa's Knob", a mountain overlooking Rutland, Vermont, stands a giant windmill that would have been the delight of Don Quixote. Towering 200 feet above the tree tops its mighty 175 foot propeller turns with the wind and drives a 1,000 kilowatt generator which feeds its output into the Central Vermont Public Service Corporation's power system. The most ambitious wind-turbine generator in the world, and a daring experiment of forward-looking men.

Today everything electrical is being tried; is being worked harder than it has ever been worked before.

Great credit is due the men behind the electric power industry. These men have recognized the responsibility of their jobs — it is a part of their very being. Theirs is the kind of service that *must* be maintained. No soldier is truer to his trust than is the employee of this great industry.

The service must go on! No matter what happens — acts of God or deeds of men — the service must go on! Labor disturbances may disrupt other industries but there have been no shutdowns due to labor trouble in electric power plants since Pearl Harbor.

And this winter when blizzards pile up drifts and sleet makes pavements slippery there may be absenteeism from other plants but the utility employees will be on the job ready to climb the ice-covered poles and repair the ice-laden lines whenever the call comes.

In this war the least costly yet the most precious element of production — electricity — will be ever ready to "man" the machines that will produce the weapons that will give victory to the forces of freedom.



President, McGraw-Hill Publishing Company, Inc.



**HERE'S SOMETHING NEW!** Something every electrical contractor and maintenance man should know about. Synthetic Insulated Wire and Cable—produced by Walker of Conshohocken!

The new insulation has many desirable properties. It is tough, flexible and long-aging. It is heat resistant and fire resistant. And—best of all!—it is unaffected by oils, alkalies, acids and moisture!

Walker "Synthetic" may be had in all standard colors—black, white, red, blue, yellow, green—and in

other colors on request. What's more—these colors won't scuff off! Sizes range from small diameter building and control wires up to large circular mil. cables.

Write for the sample card which explains features and lists suggestions for use. Walker Brothers, Conshohocken, Pa.





**"WE HAVE HAD  
... NO NEEDLESS  
FUSE FAILURES on our  
'Repulpers' SINCE WE  
INSTALLED BUSS FUSES  
Two Years Ago!"**

*Says*

CHIEF ELECTRICIAN JAMES P. COURNEENE,  
ESCANABA PAPER CO., ESCANABA, MICH.

"On a battery of 'repulpers', individually driven by 50 hp. 440 volt 3 phase motors, we formerly had, when using ordinary renewable fuses, an average of two shutdowns daily per motor. These shutdowns were due to fuse failures on the temporary harmless overloads common with this type of equipment.

"The consequent production loss involved was of considerable importance. About two years ago we equipped all these motors with BUSS Super-Lag fuses and in all that time there has not been a single fuse failure from harmless overloads.

"We have now standardized on BUSS Super-Lag fuses throughout the mill as this is only one of several instances where we have cured expensive shutdowns on similar circuits. We could hardly afford to use any other fuse."

## Here Is Why BUSS Fuses Greatly Reduce or Entirely Prevent Needless Blows

The fuse case is designed to insure good contact on the link, even when the fuse is renewed by an inexperienced person—and it is so designed that vibration or heavy overloads or the constant heating and cooling of the fuse will not permit poor contact to develop. Thus, excessive heat which causes fuses to blow when they should not is prevented.

The fuse link used is the famous "BUSS SUPER-LAG." It has lag-plates attached to it. These give it a long time-lag so that unusually heavy starting currents or other harmless overloads will not cause the fuse to blow.

## MR. COURNEENE EXPLAINS

### When Inexpensive Buss Fuses Give "Non-Shutdown" Protection, Why Bother With Costly Protective Devices That Are Not As Efficient?

Why spend extra money for costly mechanically operated devices—when you can get inexpensive fuses that hold circuits in operation for years without opening once?

Why be annoyed by useless shutdowns with ordinary fuses when BUSS construction reduces needless opening of fuses to a minimum?

The experience cited by Mr. Courneene simply proves once more that it is not necessary to suffer from useless shutdowns caused by needless opening of protective devices. It shows that once properly installed BUSS fuses can be forgotten.

They require no maintenance or periodic inspection. They don't open needlessly. If one opens, you can be sure some condition needs correction. When one opens it requires less than 45 seconds to renew it with an inexpensive link.

The experiences of thousands of plants throughout all industry have proven time and again that with BUSS Super-Lag fuses you can obtain trouble free protection at a lower overall cost than with ordinary fuses or mechanically operated devices.

### —And Here Is How To Solve The "Shutdown Problem" In Your Own Plant

Pass the word along that all purchase records dealing with circuit protective devices should be immediately changed to call for BUSS Super-Lag Renewable fuses. Then as fuses are replaced or new installations made, your plant will automatically get the benefit of the carefree, trouble proof protection that BUSS Super-Lag fuses give. BUSSMANN MFG. CO., University at Jefferson, St. Louis, Mo. Division McGraw Electric Company.

**BUSS**  
*Super-Lag*  
**FUSES**





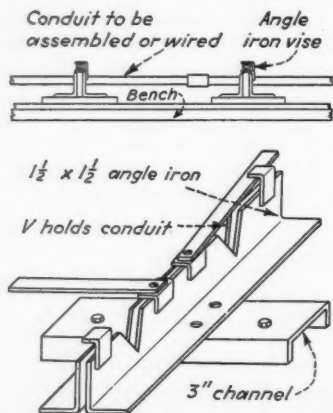
## Methods

[FROM PAGE 32]

series of double vises for bench assembly and wiring of conduit sections.

The vise is made of two 24-inch lengths of  $1\frac{1}{2}$ -in. by  $1\frac{1}{2}$ -in. angle iron, mounted back to back on a 3-in. channel iron base at right angles to the vise. A small space between the two angles gives added rigidity to the gadget and provides a more stable "seat" for the conduits placed in the angle cut-outs.

Two V-shaped openings are cut in the vertical members of the channel to "seat" the conduits and provide the "jaws" of the device. The size of the "V" is just large enough to accommodate the branch circuit conduit being installed. Two swinging flat-iron arms fastened to the center portion of the



**MASS PRODUCTION VISE** for bench assembly and wiring of lighting branch circuits. The vises, made of short pieces of angle, channel and flat iron, are mounted in tandem on the top of long assembly benches. A flip of the hand locks or unlocks conduit in the vise.

vertical angles, swing over the V openings and slip under retaining clips welded to the extremities of the vise sections of the angles. The spacing between the top of the angles and the bottom side of the clips is such that the arms, upon a slight downward pressure when the conduit is in the vise, will fit snugly under the flange of the clips.

The gadget is not a vise in the true sense of the word. It is not designed to keep conduit from turning; nor is it to be used for cutting and threading. It is only to hold conduit while it is being "made up" into sections, or while wires are being pulled into the conduits.

It is merely a device to expedite mass production methods. The John Miller Co. uses a series of these vises mounted

in tandem at specified distances along a long bench. If the bench is wide enough, a parallel set are mounted on the opposite side of the bench top. The conduits are assembled on the bench, locked into the vise and tightened up with two pipe wrenches. Circuit wires are then pulled into the conduit assemblies and drop cords attached to the outlets.

By using a number of these vises on the "make-up" bench with a special crew pre-assembling and pre-wiring branch circuit runs, considerable time and expense are saved in large construction jobs, such as the Ford bomber plant where more than 76,000 fluorescent units with branch circuits were installed—a majority being in high bay areas.

## REJECTS REDUCED BY SHRINKAGE FIT

INDUSTRIAL

The supervisor of methods, tools and equipment at the Lima, Ohio, Westinghouse plant has found another use for the many purpose infra-red lamp. His important discovery has eliminated the mechanical operation of obtaining proper press fittings between aluminum (soft) and steel (hard) metal parts for small motors.

Using infra-red heating suggested by Fred C. Gossett, the aluminum frames of motors, having a bore of  $6\frac{1}{4}$  in., are carried on a conveyor traveling 30 ft. per minute through a tunnel formed by a battery of 56—375-watt lamps. While in the tunnel, the frames are heated quickly to 150 deg. C. (302 F.) to make

them expand .020 inches. This allows enough space for the wound primary to drop into place. When cool the result is a "press" fit without scoring or galling.

## TEN WAYS TO SAVE CRITICAL MATERIALS

INDUSTRIAL

Tons of critical materials, particularly copper, can be saved by following these ten principles in installing war-plant power distribution systems, according to H. V. Erven, Manager of General Electric's Central Station Department.

1. Calculate as accurately as possible what the actual load will be and design the system to carry only that load—not on the basis of connected load.

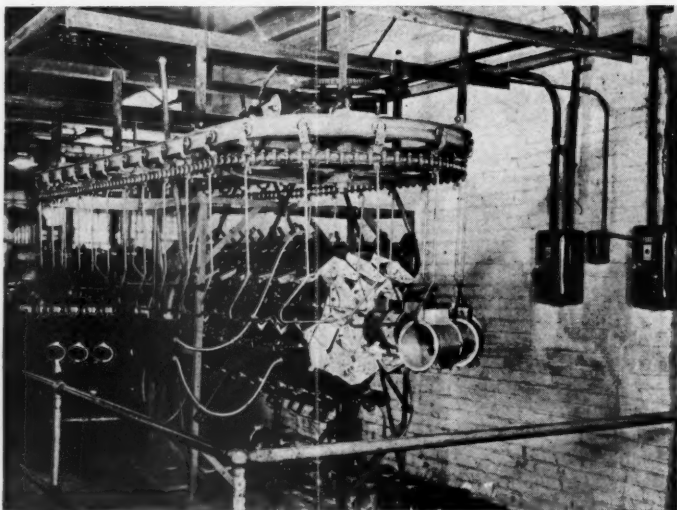
2. Keep to the practicable minimum the distance over which the electric power is to be carried.

3. Transmit power at the highest practicable voltages and bring the high-voltage distribution as close to the load as possible.

4. Correct for low power factor at a point as close to the reactive load as possible.

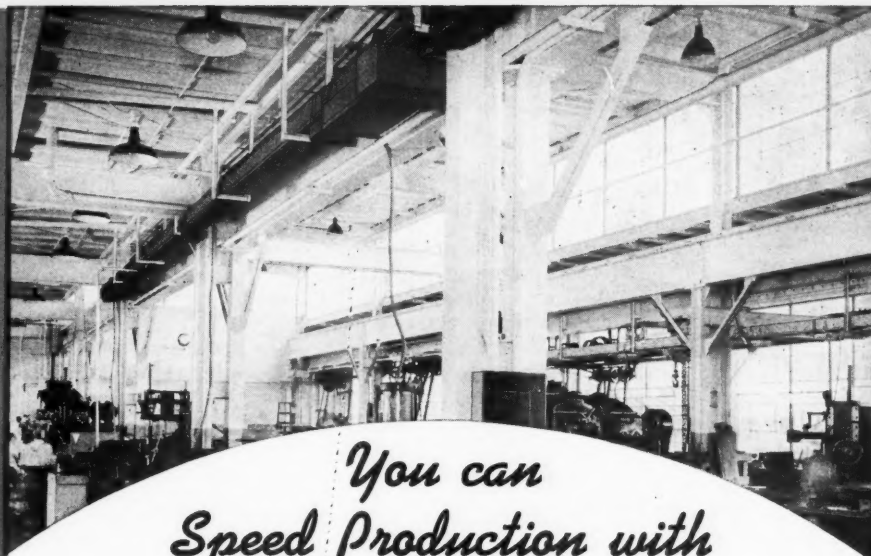
5. Use compact, standard equipments. This not only saves copper, time and money but also makes possible quick replacement in case of trouble.

6. Arrange layouts to limit circuit-breaker interrupting requirements to the optimum values, thus saving copper in buses and breakers.



**INFRA-RED HEATING** for shrinkage fit reduces rejects frequent with press fitting of aluminum and steel at the Westinghouse small motor plant. The example pictured is the aluminum motor frame suspended from the rotary conveyor.

A 300 Amp. Plug-in  $\text{\textcircled{FA}}$  Busduct run, with 400 Amp. Tap-off Switch to feed a run of 450 Amp. Plug-in  $\text{\textcircled{FA}}$  Busduct, through a conduit and cable connection.



## You can Speed Production with **$\text{\textcircled{FA}}$ BUSDUCT**

In many plants engaged in producing for war, production is speeded by the quick connection characteristics of Plug-in  $\text{\textcircled{FA}}$  Busduct. Due to its flexibility, machines may be moved to any desired position — plugged in quickly — and operation started with a real saving of valuable production hours.

Some of these plants are large — some small. Some are new construction — others are revamped or modernized. The  $\text{\textcircled{FA}}$  Busduct System fits all types with equal facility. It is the *modern method* for the distribution of current for light and power.

Both Feeder and Plug-in  $\text{\textcircled{FA}}$  Busduct may be installed with minimum labor cost, and may be taken down and moved to new locations without appreciable loss of material.

Extensions may be made readily to existing installations, which need not be disturbed.

$\text{\textcircled{FA}}$  Busduct is designed for 2, 3 and 4-wire feeder systems; 250 volts DC, 575 volts AC, maximum. Plug-in type capacities, 125 to 1,000 amperes; Feeder type, 250 amperes and up. All standard types of  $\text{\textcircled{FA}}$  Busduct are fully approved by Underwriters' Laboratories, Inc.

**Investigate this Modern Method of Electrical Distribution.** Let the  $\text{\textcircled{FA}}$  Sales-Engineer show you how it may be applied to advantage — whether in new construction or plant modernization. His long experience will be helpful — and he will be glad to consult with you — without obligation. Write for his name and address.

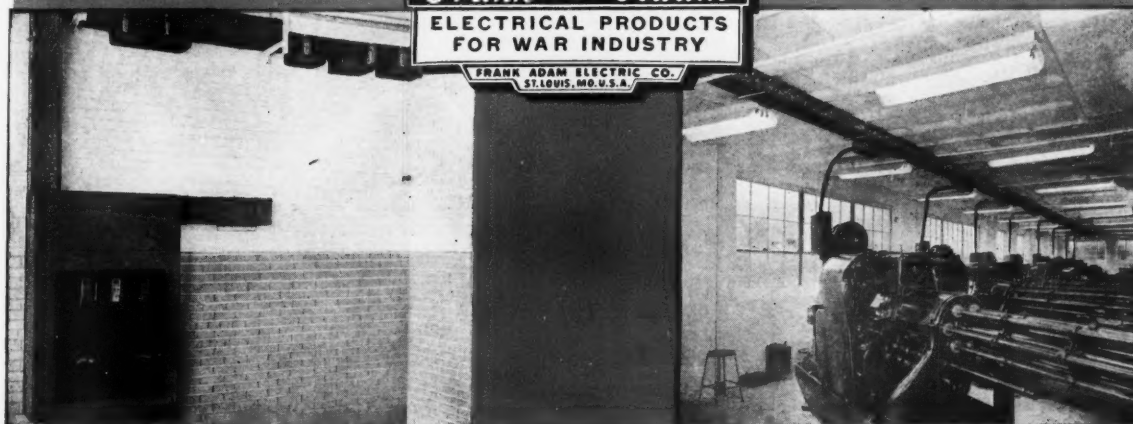
### Let Us Send You Bulletin 65

which gives full details of  $\text{\textcircled{FA}}$  Busduct installations, with photographs, diagrams, prices and suggested specifications . . . Frank Adam Electric Co., St. Louis, Mo.

Main power breaker, 1000 Amp. Plug-in  $\text{\textcircled{FA}}$  Busduct and  $\text{\textcircled{FA}}$  Plug-in Units, with service Feeder  $\text{\textcircled{FA}}$  Busduct entering at right of breaker cabinet.

(On special order, "Conservation Type"  $\text{\textcircled{FA}}$  Busduct, using a minimum of critical copper and steel, to meet W. P. B. requirements, is available.)

Part of a "loop" system of Plug-in  $\text{\textcircled{FA}}$  Busduct feeding a battery of automatic screw machines. Low headroom required duct to be mounted against ceiling.



# P&S

## PORCELAIN WIRING DEVICES

*Save  
Critical  
Material*



- ★ Install P&S cablettes for a good wiring job with a minimum of critical materials.
- ★ Easy to assemble and install —Designed for today's requirements.
- ★ Available for prompt shipment.

ELECTRICAL  
Wiring Devices  
SINCE 1890  
PASS & SEYMOUR  
INCORPORATED  
SYRACUSE, N.Y.

## Methods

[FROM PAGE 36]

7. Use three-phase power transformers wherever feasible.
8. Use forced cooling on power transformers wherever it is practical.
9. Select cables with a type of insulation which will permit maximum load per unit of copper.
10. Limit the number of cables per duct bank to the minimum to avoid loss of current-carrying capacity.

## SOLDERING WITH SPOT-WELDER

INDUSTRIAL

Many organizations, industrial firms, and the like have to convert old outmoded machinery to efficient production equipment. A case in hand is the Jacques Kreiser Manufacturing Company makers of fine and novelty jewelry. Kreiser was going to swing into enlarged production of novelty military jewelry (this was before the metal shortage stopped the manufacture). With the new production came a bottleneck of how to attach the emblems such as for the Army, Navy, Marines, Air Corps, etc., to the finished piece without any discoloration.

The answer was found in a common spot-welding outfit. Primary voltage is reduced from 208 to 2 volts secondary by the transformer and raises amperage to 250 at the secondary tap. By this simple set-up the emblems can then be soldered to the finished jewelry without discoloration.



OPERATOR completes the "weld" by pushing the contact jaws to the jewelry and holding them there until he can feel the solder being fused.

## CAMP LEE TRAINS ELECTRICIANS

TRAINING

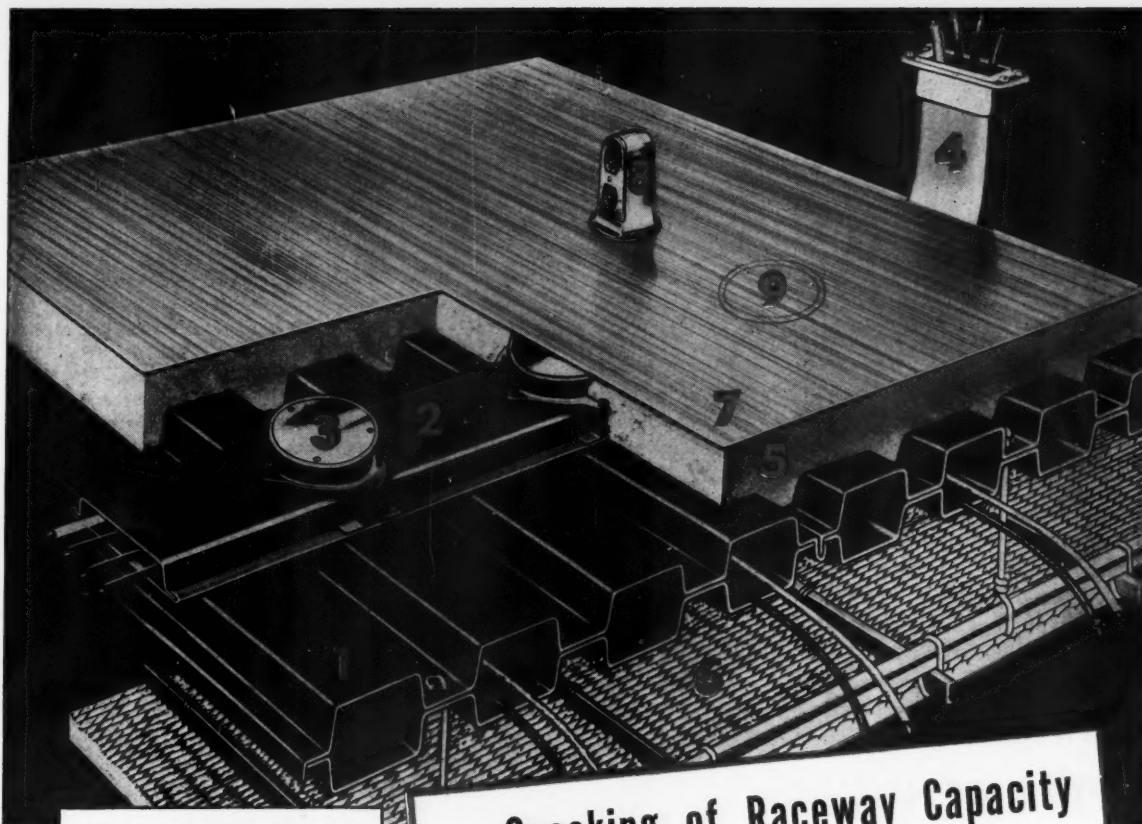
Every branch of the Army, including the Quartermaster Corps, must have trained electricians to keep electrical energy flowing, to keep Army refrigerators, sewing machines, generators, light bulbs, power drills, and ventilator fans in working order.

Amid the hum and clanger of one of Camp Lee's (Va.) huge technical training shops, Quartermaster trainees are working out some of the practical problems they will later encounter as skilled electrical maintenance men. The Electricians School is directed by Mr. Richard C. Miller and a staff of experienced non-commissioned instructors, and is part of the Quartermaster Replacement Training Center's program of Supply Training under Col. John V. Rowan.

All but a small proportion of the trainees assigned to the school have had some previous experience as electricians. Electricity comprehends a huge quantity of theoretical and practical knowledge, to which specialists ordinarily devote years of study. Since it is manifestly impossible to turn a raw trainee into a trained electrician in a few weeks' time, the school limits itself to the practical aim of adapting civilian experience to Army needs. The end-product of the school is rated as skilled, semi-skilled, or a helper, according to his versatility as an electrical technician.

Like most Army technicians, the Quartermaster electrician is something of an odd-job man, that is to say, in comparison to his civilian counterpart, his utility is general, rather than specialized. His role is necessarily flexible, since the swift and unpredictable pace of a strenuous campaign may force him to repair any type of installation.





**This is a complete  
ROBERTSON  
Q-FLOOR**

1. The structural floor
2. The crossover wireway
3. The handhole (into the cell)
4. The ell connecting the crossover wireway with the panel box
5. The lightweight fill (usually 2½ inches)
6. The suspended ceiling (¾-inch vermiculite plaster)
7. Floor finish (can be any type)
8. Floor outlet head (can be set anywhere)
9. Adapter plate, covering used handhole

**Speaking of Raceway Capacity  
Q-FLOORS HAVE IT!**

Here, staring you in the face, are Q-Floor raceways with greater wiring capacity than any building will ever require. And each raceway is easily accessible through the crossover wireway (2 . . . in the illustration), in conjunction with other Q-Floor details.

Cross section shows, too, how quickly changes in floor outlets can be made. An outstanding example will be found in the Federal Office Building, at New Orleans, where hundreds of new outlets have been recently installed . . . for new telephones and business machines . . . at new desks.

Q-Floors eliminate many former handicaps. With their larger capacity raceways they simplify the layout as well as the handling of the job. They facilitate planning. Fewer risks are run with the less experienced crews which cannot be avoided under war conditions.

These and many other Q-Floor advantages all add up to greater profit for the electrical contractor. Q-Floors help reduce non-productive labor, maintain a balanced crew and help take out the "peaks and valleys" in your labor curve.

**H. H. ROBERTSON CO. • Farmers Bank Building • Pittsburgh, Pa.**

# ROBERTSON Q-FLOORS



# YOU GET ALL THREE with a **BLACKHAWK** Pipe Bender



Blackhawk Benders do MORE than bend pipe. They include a Porto-Power Hydraulic Unit that can be used separately from the bending attachments. Here is the triple utility:

## 1 PIPE BENDING

Smooth, remotely controlled hydraulic power bends rigid conduit and pipe up to 4" diameter. Saves need for elbows and couplings and otherwise necessary cutting and threading.

## 2 MAINTENANCE AND PRODUCTION

Big range of attachments adapt the hydraulic unit to push, pull, bend, press, spread and clamp work. Pull gears and pulleys, lift machinery, (as shown at left)—do scores of other jobs allied to pipe bending.



## 3 SPECIAL JACK

Compact 10 or 20-ton ram (same as used in pipe bending) works in all directions — and at any angle. Preferred to all other types of jacks.

### MAIL COUPON TODAY

BLACKHAWK MFG. COMPANY  
Dept. P2013, Milwaukee, Wis.  
Send Full Information on your Pipe Benders.

Name.....

Company.....

Address.....

## Methods

[FROM PAGE 38]

Instruction in the Electrician's School is therefore both practical and varied. At least 80 percent of the time is allotted to practical work, either experiments with the various machines in the shop, or repairing of installation about the post; the remainder is devoted to lectures. The list of day-to-day subjects shows the predominance of the matter-of-fact over the theoretical, thus from a preliminary examination of basic electricity and magnetism, the trainees pass immediately to direct and alternating currents; electrician's tools; the ammeter and voltmeter; electrical supplies; safety and first aid; wiring methods, extensions and connections; soldering; inside wiring according to the National



FUTURE QUARTERMASTER electrician specialist learns how to install outlets.

Electrical Code; blueprints; meters, switchboards; light fixtures; generators; storage batteries; the internal combustion engine; outside, overhead wiring; and underground thermostats; electrical stoves; refrigeration.

On a large post like Camp Lee there is practical work in abundance for trainees from the school. In the twelve technical training shops along "Shop Row," trainees have looked after the maintenance of electrical wiring. They also installed the wiring in two mobile laundry units, and a mobile clothing and shoe repair unit. These units are now being served by Quartermaster crews with American forces in the field. The school installed and is now expanding the communications systems used on the post, and built the public address units

which are widely employed for training and recreation. One of these units, for example, is used to project recorded battle-sounds during certain field exercises, and more commonly to enable officers to direct mass drill. On occasions, virtually the entire personnel of the post has been assembled in one place to hear amplified radio addresses, such as that of the President on the day after Pearl Harbor. Trainees also helped install the camp-wide broadcasting network. In general, although electrical repairing is the normal function of the Utilities division, trainees from the Electrician's School help keep post electrical installations in order and at the same time sharpen their craft for the test which they will one day face.

Quartermaster electricians fulfill primarily a function of maintenance. Whether in a permanent post or with troops in the theatre of active operations, their job is part of that larger job for which the Quartermaster Corps exists: To feed the men and machines of war and keep them moving. Cooks, clerks, truck drivers, or electricians—they do not fight except in self-defense, but without them the battles could not be fought.

## DEAD END BRIDLE FOR MESSENGER CABLE

—WIRING


The dead ending of messenger cables supporting lighting circuits and fixtures has always been somewhat of a problem. In smaller buildings with brick walls and short spans through-bolts in the walls or steel beams might solve the problem. In today's large modern steel and glass industrial plants, with their increasingly longer spans, the problem becomes more complex. There are no brick walls to mount to and dead ending hundreds or thousands of long-span, between-column, supporting messenger runs in the steel beams might produce undesirable and dangerous bending moments in these structural members.

In the lighting installation at the Ford Willow Run Bomber plant, particular attention was devoted to the elimination of such bending stresses as might occur when taut messenger cables are dead ended to steel beams. In this particular installation, with long-span messenger runs and heavy industrial fluorescent equipment, these stresses were reduced by using a unique bridle arrangement.

This "dead end bridle" (see accompanying cuts) was made up of the following components; two 1/4-inch trian-



## TRUMBULL heavy duty "RBA" safety switches

 Frequent operation under severe load conditions called for by three shift industrial production schedules puts a strain on mechanical and electrical features that only a specially designed product like the Trumbull "RBA" can withstand.

Built into this compact, engineered switch of high interrupting capacity are operating and protective features, soundly conceived and ruggedly constructed for heaviest duty. "RBA" is a "saver" in time . . . space . . . and maintenance . . . all vitally important to industry today.

**TIME-SAVER** . . . because the entire saddle-mounted operating switch interior is *removable as a unit* for economy and convenience in wiring . . . because the *operating handle* is so constructed that it has all the advantages of *front operation*—none of the re-

strictions of side operation. The *side hinged door* far surpasses the usual screwed-on front cover.

**SPACE-SAVER** . . . because front operating handle permits *close ganging* for a battery of switches . . . because cabinets are built just sufficiently large to provide easy wiring gutters . . . no waste space.

**MAINTENANCE-SAVER** . . . because Vystipe Fuse Clamps reduce fuse heating more than 50%, minimizing need for fuse replacements. Because the "SNUF-ARC" chamber, tied in with the *self-wiping silvered roll contact*, effectively quenches the arc as the contact recedes into the protective chamber. Because the *releasable interlock* permits quick check-up under load by authorized persons.

Added features are: safety cover catch, solderless lugs, fast making and breaking speed, high interrupting capacity, attractive heavy steel cabinet.

Send for Bulletin 300 for complete details.



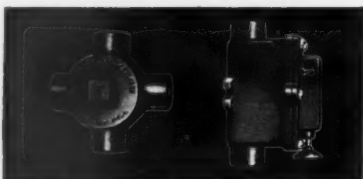
THE TRUMBULL ELECTRIC MANUFACTURING COMPANY • PLAINVILLE, CONN. • A GENERAL ELECTRIC ORGANIZATION

OTHER FACTORIES AT NORWOOD (CINN.) O. — SEATTLE — SAN FRANCISCO — LOS ANGELES

Explosion-proof  
and Dust-tight

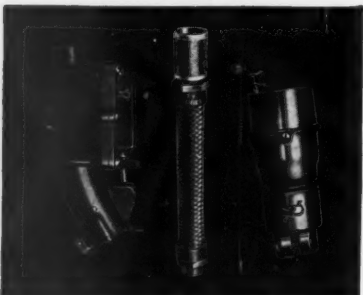
## PYLETS

★ This line of Pylet conduit fittings offers correct design and unusually substantial construction for general wiring purposes in hazardous locations. Dependable protection against severe operating conditions is assured, plus convenient, labor-saving features that conserve time in application. Write for Pylet Catalog 1100 with complete listings.



**Junction Pylets**, with threaded covers. Explosion-proof and dust-tight. Also with union hubs. (Type VT)

**Tumbler Switch Pylets**, with push-pull rod. Explosion-proof and dust-tight. Single, two and three gang. (Type ERS)



**Switches with interlocking plug receptacle**. Explosion-proof and dust-tight. Interlock enforces safe use. Extra pole for equipment ground circuit. (Type YX)

**Plugs**, complete with strain relief cord grip. Grounded through shell and extra pole. (Type PKD)

**Pyle-O-Flex**, the original, explosion-proof, dust-tight, and waterproof flexible fittings. Especially useful for motor connections; withstand vibration and permit base adjustments. With plain or union end fittings. (Type FY)



**Sealing Pylets**, for vertical mounting. (Type VY)

**Sealing Pylets**, with removable inspection cover and close-up plug. For vertical or horizontal mounting. (Type VA)

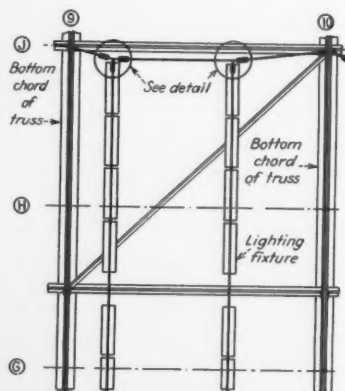
Write for your copy of Pylet Catalog 1100 with complete listings of all types.

**The Pyle-National Company**  
1344 N. Kostner Ave. • Chicago, Ill.

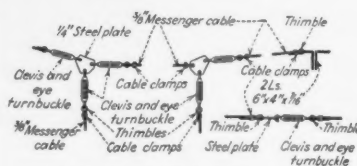
## Methods

[FROM PAGE 40]

gular steel aligning plates, one equipped with three clevis and eye turnbuckles, the other with two such turnbuckles; three lengths of  $\frac{3}{8}$ -inch messenger cable to form the bridle, the lengths depending upon the relative position of the rows of fixtures with respect to the roof trusses in that particular bay. One side of each aligning plate was tied together by the intermediate messenger cable, the length being determined by the spacing of the fixture rows. A second side was fastened by cable to the intersection of the steel roof trusses. The third side was left free to dead



**DEAD END BRIDLE** supports long span lighting circuit and fixture messenger cables, reducing bending moments on supporting beams and resolving stresses into compression components at roof truss junctions.



**DETAIL OF BRIDLE** shows the mounting arrangement of the aligning plates, clevis and eye turnbuckles and dead ending of supporting messenger cables to the roof truss structure.

end the messenger cable supporting the lighting circuits and units. Thus, three turnbuckle adjustments were possible—at the end of the supporting messenger cable, at the cable tie between fixture rows, and at the cable ties to the roof truss junctions. This bridle, designed by Albert Kahn Associated Architects and Engineers, Inc., architects and engineers on the job, relieves flexing of the beams which would occur under

conventional dead ending practices, and resolves the dead ending stresses into compression components at the junction of the beams and roof truss chords.

## DAILY JOB LOG

WIRING

Harry Evans, Evans Electrical Construction Co., Kansas City, Mo., has devised a method of cutting down considerable leg work on out-of-town construction. He keeps a daily log on what is being done on each job. It's similar to a condensed diary of the job superintendent.

At the end of each day his project superintendent makes out a complete report of the progress of the construction work, the meetings he attended, what was said, changes in plans and specifications, changes in job orders and other vital construction statistics. This is sent to the home office and after being studied, is filed with others in a job folder. As the reports accumulate they form a complete word picture of the progress of the work.

Harry studies this folder daily to follow the job. When he plans to visit the job site, a reference to these reports gives him a substantial background and he eliminates the necessity of tramping around the project to see what has been done, saving his own time and that of his field superintendent.

On joint venture enterprises, copies of these daily reports are sent to the offices of all parties to the combination so everyone interested is apprised of job developments. With gasoline rationing, tire shortages, and increasing travel difficulties, this is one way of bringing the project right into the office.

## UNIT HEATERS PROVIDE PROFITABLE TURNOVER

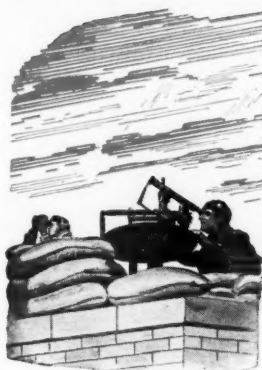
INDUSTRIAL

The Toledo Concrete Pipe Company, at Silica, Ohio used ordinary pipe coil for the drying of concrete pipe and this method involved high labor and fuel costs. The concrete being dried is known as dry concrete.

The standard method of drying this pipe was as follows: At 7 a.m. the loading of pipe into the kilns was begun. By noon the operation was completed. Curtains at both ends of the kiln were then dropped, and the steam turned on. Under this system, approximately 24 hours had to elapse before a start could be made in unloading the kilns. Additional time was then required for the



# **QUICK** TO PROTECT PRODUCTION **SLOW** TO INTERRUPT PRODUCTION THE NEW **QUICKLAG** **NOFUZE "De-ion" BREAKER**



Like the "spotter" of enemy planes on the roof of a war production factory, the QUICKLAG circuit breaker keeps production moving as long as it is safely possible.

This new breaker successfully combines in a single unit a co-operative thermal-magnetic trip action—something never offered before in a protective device.

By this co-operative action, QUICKLAG meets all three requirements of modern light-

ing, appliance and fractional horsepower loads:

- PREVENTS UNNECESSARY CURRENT INTERRUPTIONS on harmless overloads.
- PROVIDES MORE ACCURATE BURN-OUT PROTECTION on sustained overloads.
- INTERRUPTS SHORT CIRCUIT CURRENTS as great as 5,000 amperes within 1/240th of a second.

Write today for your copy of "QUICKLAG" Bulletin 3146. It demonstrates with graphs how this new breaker gives practical protection for small wire sizes. Or ask your Westinghouse representative for a copy. Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., Dept. 7-N. J-60517



## **WHY QUICKLAG IS MORE DEPENDABLE, STAYS ON THE JOB LONGER**

- 1 BEARING SURFACES ARE OF DISSIMILAR METALS to insure against sticking and to reduce wear.
- 2 HEAVY-DUTY FLEXIBLE SHUNT is electrically welded, keeps wattage losses down.
- 3 QUICK-MAKE, QUICK-BREAK mechanism prevents "teasing" contacts.
- 4 "DE-ION" ARC CHAMBER minimizes arcing, increases contact life.

## **HOW QUICKLAG GIVES GREATER PROTECTION WITH FEWER INTERRUPTIONS**

- 5 BI-METAL THERMAL ELEMENT provides accurately calibrated flexing action when heated, plus proper tension for spring action to restrain magnetic element on short-time overloads.
- 6 ELECTROMAGNET ELEMENT operates instantly on short circuits.
- 7 ACCURATE CALIBRATION—Calibrating screw provides accurate and uniform calibration during manufacture; is then sealed to prevent "tampering" after test.



**Westinghouse**  
**NOFUZE**

**CIRCUIT PROTECTION**

### **SPECIFY QUICKLAG PANELBOARDS**

Westinghouse builds QUICKLAG breakers in panelboards of the single-row type shown at left, suitable for H-beam mounting, and the double-row type for wall mounting. Other Westinghouse panelboards are available having combinations of QUICKLAG and 2 or 3-pole common-trip Nofuze "De-ion" breakers.







## NEW Black Polymerizing Varnish

Not only does SYNTHITE PX-5 Black Baking Varnish cut baking time to a minimum but it also provides better insulation with less coats.

Curing by heat through chemical polymerization, this varnish will dry even in the deepest interstices of large coils. Then too, shorter baking will permit flexibility, yet cure the varnish evenly throughout. SYNTHITE PX-5 Black Baking Varnish possesses the essential bonding properties which will hold windings intact under the centrifugal force produced by high speed motors. It is ideally suited for use on the modern types of enamelled magnet wire and Class B insulation. This material affords maximum resistance to acids and alkalies and can withstand high temperatures. It can be applied on all types of electrical units and can be baked out by infra-red equipment or the conventional baking oven. Write for specifications.



**JOHN C. DOLPH COMPANY**

*Insulating Varnish Specialists*

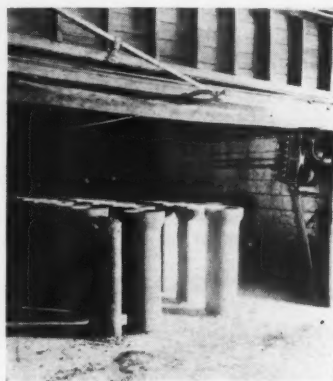
168-A Emmet St., Newark, New Jersey

## Methods

(FROM PAGE 42)

kilns to cool off before the men could enter for unloading.

Because this method was too expensive for economical operation it was decided upon to look for another source of heat. Two 11g unit heaters in each of five kilns were installed to replace the system of steam pipes. They main-



**TWO UNIT HEATERS**, placed in this kiln effectively cut the time of curing and drying concrete pipe.

tain a temperature of 150F. even if outside temperature is as low as 10 deg. below zero. The units were installed on one side of the kiln, as shown in the illustration, and deliver a turnover of air approximately once every 1½ min. For moisture required in the curing operation, a small percentage of return water is permitted to drip from a valve.

The savings in coal are substantial and the product is cured just as well as it was under the old method. The men are now able to get into the kilns much sooner which gives a greater turnover of materials being dried and cured.

## PORCELAIN OUTLET BREAKAGE REDUCED

The Overton Electric Company of Topeka, Kansas, had its initial experience with porcelain boxes while wiring barracks at Camp Funston, Fort Riley, Kansas. Naturally, breakage was very high at first, since the men were accustomed to handling only steel boxes.

Safford D. Thacher, in charge of Overton's electrical construction department, took the situation in hand and accelerated the job and reduced breakage

to a minimum. He simply applied assembly line technique and delegated one man to do nothing but prepare the boxes for the wiring crews. Soon this chap became highly proficient in the art of making knockouts and handling and stacking the outlets.

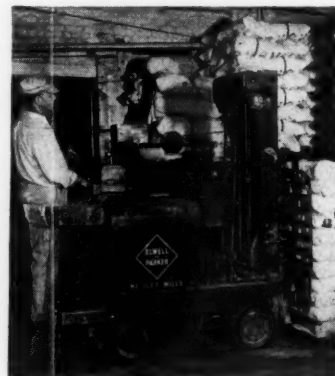
Mass production methods were used throughout. Knockouts were listed from plans, boxes were packaged according to job units. The electrician mounting the outlets had a carton waiting for him each morning containing the correct number of boxes with the proper knockouts. Specialized installation crews were used: one to drill all holes; a second to mount the boxes; a third to string the cable; and a fourth to make connections, mount fixtures, receptacles and switches.

## CAR LOADING TIME CUT

INDUSTRIAL

Time is a premium factor in today's way of thinking. When a plant can save hours by doing a job differently it is news that is of interest to all plants working on war production. Even seconds count.

Making every man-second count is well illustrated by a clever device invented by Wm. P. Bomar, vice president and general manager of Bewley



**THE ELWELL-PARKER "MULE"** with its load ready for low-level stacking.

WIRING

Mills, Fort Worth, Texas. The fork device, attached to an electric "mule" stacks sacks, cartons, and packages to any desired height in box cars. It withdraws the pallet while holding the load in original stacked position and operates from storage batteries.

A total of 144 twelve-pound sacks of flour have been loaded in a car in 15 man-seconds whereas the same job required 405 man-seconds previous to installing the simple gadget.

# YANK A MACHINE



## ...without cutting power

Moving machinery—changing shop set-ups—is an everyday job in modern war plants. But it's a quick and easy job in plants equipped with sectionalized, prefabricated "plug-in" Bus Duct.

No cutting, taping or other fabrication is necessary in making the original installation—or in changing the location of a machine or a whole production battery.

Just move the circuit protective "plug" right with the machine, mount it on the Bus Duct at the "plug-in" opening nearest the new location—and the job is done without cutting power, interrupting production, or taking the dangerous alternative of tapping in "hot."

All through America's non-stop production drive Bus Duct is saving countless man-hours, multiplying efficiency, protecting against fire and sabotage, safeguarding human life . . . and all this with a minimum use of critical materials.

Modern Bus Duct is an integral part of the machine tools it serves. Small wonder that it has become a *necessity* in present-day mass production.

BUY MORE WAR BONDS—SALVAGE ALL SCRAP METAL

## BULLDOG

ELECTRIC PRODUCTS CO.

Detroit, Michigan

Bulldog Electric Products of  
Canada, Ltd., Toronto, Ontario  
Field Engineering Offices  
in All Principal Cities



BULLDOG "PLUG-IN" SYSTEMS—THE ARTERIES THAT SUPPLY POWER  
AND LIGHT FOR WAR PRODUCTION

# FACTS YOU SHOULD KNOW ABOUT NON-METALLIC REFLECTORS

*for Fluorescent Fixtures!*



## EFFICIENT NEW REFLECTORS RELEASE TONS OF STEEL FOR OTHER WAR PRODUCTION

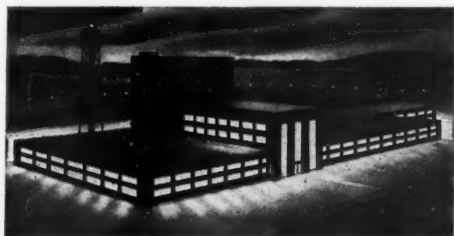
**I**NTENSIVE work by the lighting industry now has developed non-metallic reflectors for fluorescent lamp fixtures. They are efficient, light in weight and built to stand up under hard usage in industry.

No more steel reflectors may be manufactured except for dust-tight and vapor-proof units. Realizing the need to conserve metal, lighting engineers have been working for almost a year to find alternate reflector materials. They have succeeded. General Electric is proud to have been able to contribute to the research that has made these efficient new reflectors possible.

There have been, of course, many experiments with non-metallic reflectors. To make certain that the reflectors on the fixtures you get will give uniformly satisfactory service . . . that they will be strong and durable . . . you will find it advisable to buy tested and certified fixtures. Look for the Fleur-O-Lier or RLM label!

**G-E MAZDA LAMPS**

# Here are the **ANSWERS** to your questions -



**1 - WHO IS ELIGIBLE TO BUY THEM?** The new fluorescent fixtures with non-metallic reflectors may be sold to any user engaged in essential war work who can furnish a suitable priority.



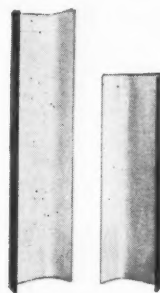
**2 - WHAT IS THEIR LIGHT OUTPUT?** Laboratory tests show that the special baked enamel surfaces of the new reflectors have a very high reflection factor, fully equal to that of vitreous porcelain enamel metal reflectors.



**3 - HOW MUCH DO THEY WEIGH?** The new reflectors are substantially lighter than metal reflectors. The reflectors for 40-watt fluorescent lamps weigh 5 or 5½ pounds; those for 100-watt fluorescent lamps weigh 8½ or 9½ pounds.



**4 - ARE THEY STRONG AND DURABLE?** Yes! They are built to withstand any force or strain encountered in normal service, such as shipping, installation and maintenance, and dry and moist conditions ordinarily encountered in industrial interiors.



**5 - HOW BIG ARE THEY?** There are two general lengths—one to accommodate two (or three) 40-watt 48" lamps and the other to hold two 100-watt 60" lamps. The Federal Government's Bureau of Standards in Washington has furnished the industry with standard cross-section designs for both sizes.

\* \* \*

**6 - WHO CAN SUPPLY FIXTURES WITH THE NEW REFLECTORS?** Any Fleur-O-Lier or RLM manufacturer can supply you. By buying from one of these manufacturers you get tested and certified fixtures.

\* \* \*

*General Electric's policy is to cooperate closely with the manufacturers of lighting equipment rather than to make fixtures itself.*

## GENERAL ELECTRIC



# Questions ON THE Code

Answered by  
**F. N. M. SQUIRES**

Chief Inspector, New York Board of Fire Underwriters

## MOTOR CONTROLLERS AND DISCONNECTING SWITCHES

**Q.** "Is there a rule that requires a motor disconnecting switch or a motor controller to be readily accessible?"—L.W.

**A.** Inspection authorities have always required that motor controllers and disconnecting switches be accessible and have felt that they had code backing for their requirements. They did.

In issues of the Code previous to 1937 we had to look in at least three Articles for rules governing motor installations. We had to consult Article 8 for over-current protection and wire sizes for motors, Article 10 for controllers, disconnections and grounding, and Article 12 for information about switches.

It was always considered to be the intent of the Code that all of the applicable rules of the various parts of the Code would be followed. One of these was the rule in Section 1202, sub-paragraph b (1935 Code), to the effect that all switches were to be placed in accessible places. It has not been considered the intent of the Electrical Committee to delete that rule even though it was intended to gather all of the rules pertaining to motors and put them under one heading—"Motors and Controllers" in article 430 of the 1937 (and 1940) Code. This basic rule on switches is now found in Section 3808 of the 1940 Code but it still applies to switches used on motor circuits.

Of course we must note the distinction between switches which are "accessible" and those which are "readily accessible" in accordance with the definitions of these terms in Article 1 of the Code Section 2808, which requires that switches be merely "accessible" and not necessarily "readily accessible."

## LIGHTING AND POWER CONDUCTORS

**Q.** "I am now employed at a Naval Air Station. In the course of laying out a job, we ran across a difference of opinion on a matter of 'Code'."

"The problem is this: a 3 wire, 3 phase, 220 volt power feed enters a 110 volt lighting panel, which is fed from a separate bank of transformers, and passes through into an adjoining panel. A 2 wire, 110 volt circuit leaves the 110 volt panel in the same nipple with the 3 phase, 3 wire, 220 volt feeder and enters the adjoining power panel. From the power panel, both the 110 volt lighting circuit and a 3 phase power circuit leave in the SAME conduit for about 50 feet. At this point there is a junction box. The 110 volt lighting circuit terminates in a receptacle mounted on

the cover of the box and the 3 phase circuit continues on its way.

"I maintain that since the lighting panel and the power panel are fed from two separate banks of transformers, they are two separate systems, therefore they should not be run in the same conduit. Could you give me an opinion as this is quite important?"—G. B.

**A.** According to Section 3013 of the 1940 Code, it is permissible to run the 110 volt single phase lighting conductors within the same conduits and enclosures with the 3 wire, 3 phase, 220 volt power conductors.

This rule was new in the 1940 Code as previous Codes had prohibited this kind of an installation.

## RANGE AND WATER HEATER INSTALLATIONS

COMMENT—"I have an installation as follows:

"Three No. 4 conductors, 1½-in. conduit feeding range circuit, and 1—3-wire No. 10 branch, which in turn feeds 6—15 amps. branches,—1 No. 14 circuit for basement.

"The above is the original installation; now I have added a water heater circuit as follows:

"I tapped service conductors on line side of switch with No. 12 R.C. wire run to time switch socket and return in ¾-in. conduit to 30 amp., 2 pole, 250 volt switch on line side, then from load side to 3000 watt water heater with 2—No. 12 R.C. in ½-in. E.M.T.

"Will you please answer the following questions:—R.J.R.

**Q.** No. 1—"Is water heater installation a service coming under 2302c and 2305a in regards to single circuit service or is it a branch circuit?"

**A.** No. 1—The water heater installation as described is not a separate service installation as spoken of in Paragraph 2302c, inasmuch as it is not a complete service installation from the outside supply line. It does, however, come under 2307b, in that taps to the main service conductors are permitted to connect to up to six service switches. In this case there are to be two; the original one and the new one for the water heater. This installation does come under 2305a, and this tap for the water heater service must not be smaller than No. 12 and is permitted to be No. 12 because it supplies only one branch circuit (that to the water heater).

However, there is one change to be made to the arrangement set forth in the statement, and that is that the service

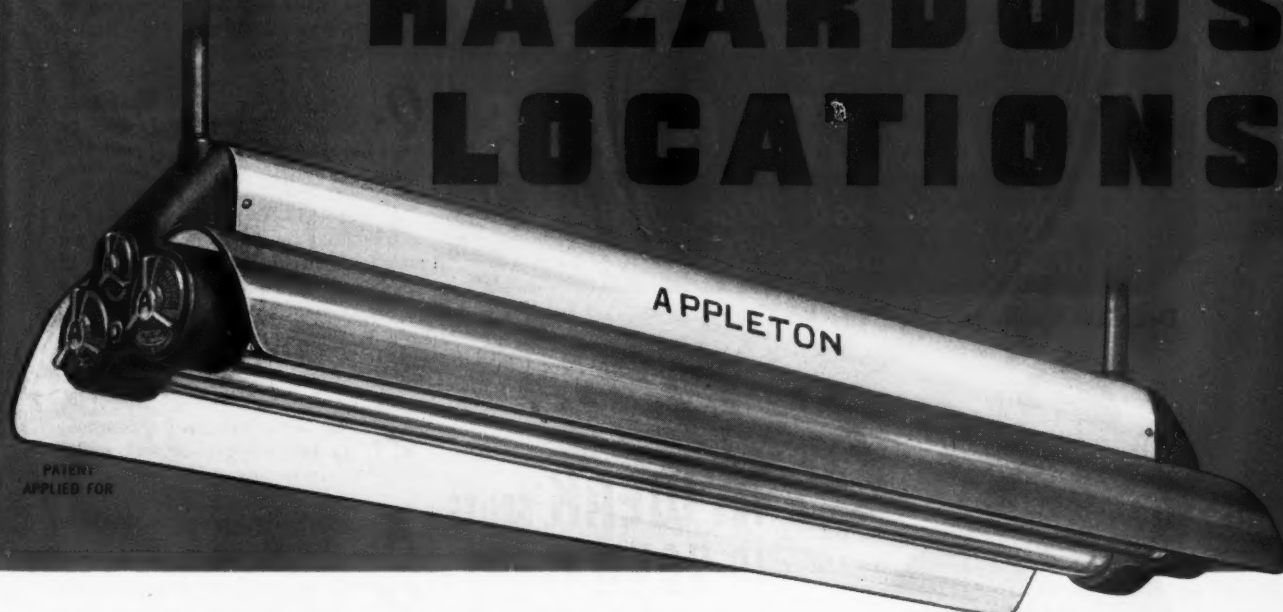


**W. T. McAULEY**, president, W. T. McAuley Electrical Contracting, Inc., Kansas City, unearths some new ideas for electrical systems to get converted war plants in production while using the minimum of critical materials.

# Now..

FOR THE FIRST TIME!

# FLUORESCENT LIGHTING *for* HAZARDOUS LOCATIONS



## Explosion-Proof Fixtures for Modern Illumination — Right When Industry Needs It Most!

Highly flammable and explosive vapors no longer bar efficient modern fluorescent lighting! Appleton engineers have perfected an explosion-proof fluorescent unit, designed for use in Class I, Group D, and Class II, Group G, hazardous locations.

Night-shift war production in those locations can now be stepped up through improved illumination. Workers will see better, will tire less easily.

Appleton Explosion-Proof Fluorescent Units are equipped with two 48-in., 40-watt lamps, com-

pletely enclosed in Pyrex tubes. Lamps, starters and ballast are easily, quickly accessible; maintenance cost is low. All factory connections are made to terminal blocks provided for line connections.

Splices are eliminated. The fixtures are sturdy—like

all Appleton Explosion-Proof equipment — built to stand up under heavy duty and provide a *wide margin of safety*.

This timely Appleton development opens an important new field for fluorescent lighting; it presents a big opportunity for the contractor! Check over the hazardous locations in your territory where war work may be hampered by the need for better light. Wherever you find one, you can expect to find a job.

Sold Through Wholesalers

## APPLETON ELECTRIC COMPANY

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Branch Offices: NEW YORK, 76 Ninth Avenue • DETROIT, 7310 Woodward Avenue • CLEVELAND, 1836 Euclid Avenue • SAN FRANCISCO, 655 Minna Street • ST. LOUIS, 420 Frisco Bldg. • LOS ANGELES, 100 North Santa Fe Avenue • ATLANTA, 175 Luckie Street, N. W. • BIRMINGHAM, 6 N. Twenty-first Street • MINNEAPOLIS, 305 Fifth Street, S. • PITTSBURGH, 418 Bessemer Bldg

Resident Representatives: Baltimore, Boston, Cincinnati, Dallas, Denver, Kansas City, Milwaukee, New Haven, New Orleans, Philadelphia, Seattle



The COMPLETE Appleton line of "Unilets" and fittings includes hundreds of types meeting every requirement

"STANDARD FOR BETTER WIRING"

# A P P L E T O N

# Bin LIGHTING

For full illumination of Parts Bins, Tool Crib Bins and Shelves, Stock-room Shelves, Carton Stacks, File Rooms, Library Stacks—wherever you need "quick, accurate seeing" from top to bottom, install PERMAFLECTORS, the silvered-glass reflectors especially designed for this purpose. Easily, quickly, inexpensively installed. Get prompt delivery... No priority on GLASS!



**HIGH-EFFICIENCY PERMAFLECTORS**

**SILVERED GLASS**

*Conserve Critical War Materials  
Assure Prompt Delivery!*

**Decrease Spoilage — Reduce Accidents — Speed Production**



**Light Up  
THE WEAK SPOTS  
IN YOUR PLANT!**



Need MORE light, BETTER light here and there in your production line? ☉ Put in Permaflex "Auxiliaries"—the high-efficiency, silvered-glass reflectors that put the light where you need it, as you want it! ☉ A size and shape for any desired distribution. ☉ Easily, quickly, inexpensively installed without affecting work flow. ☉ Use Minimum Critical War Materials! ☉ Specify Permaflex! ☉ A Pittsburgh lighting engineer will be glad to go over your plant without obligation!

**PITTSBURGH  
REFLECTOR CO.**



402 OLIVER BLDG. - PITTSBURGH, PA.

**Tear Off**

Clip to letterhead.  
Sign. Mail for  
complete information,  
prices.

*Questions  
ON THE  
Code*

[FROM PAGE 48]

switch and fuses for the water heater must be placed ahead of the time clock in order that they will control and protect the time clock.

**Q.** No. 2—"Under this setup, is there a violation of 2434d?"

*Note—No. 12 conductors are less than 20 feet to fuses and switch (15 amp. fuses).*

**A.** No. 2—If the service switch and fuses are placed as near as possible to the point at which the No. 12 sub-service is tapped to the No. 4 service wires, there will be no violation of Rules 2372 and 2351a and there is also no violation of Rule 2434d.

**Q.** No. 3—"For a 3000 watt load, would a No. 14 R.C. wire be large enough from load side of switch to heater?"

**A.** No. 3—As it is permissible to place a fixed appliance (not motors) load of 15 amperes and a 15 amp. branch circuit under the protection of 15 amp. fuses, this 3000 watt load can be supplied by means of No. 14 wire from the load side of the switch to the heater.

**Q.** No. 4—"Is there any reason why a 2 pole, 250 volt, 30 amp. switch can't be used on this sort of job?"

**A.** No. 4—Such a switch should be acceptable.

**Q.** No. 5—"The WPB limits installations to four outlets in bedrooms; if a customer wants only one center light, one switch and one plug, must he have another plug to comply with 2110 or has this section been altered for duration?"

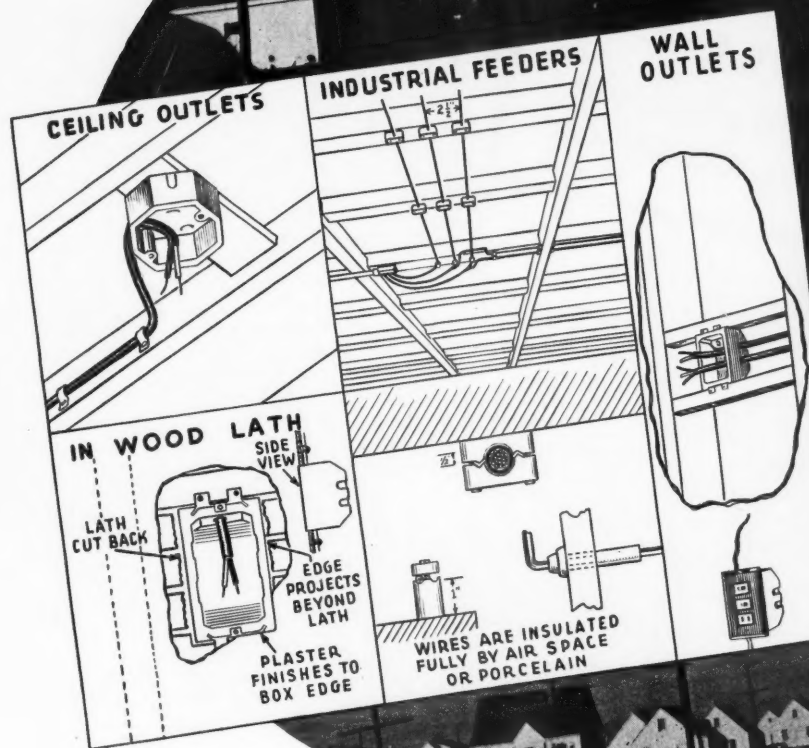
**A.** No. 5—There has, as yet, been no revision of Section 2110 for the duration. If the lineal distance around the room is over 30 feet, there should be two receptacles and if it is over 50 feet, there should be three. However, in the switch box from which the center light is controlled, there may be used a combination switch and receptacle body which gives an additional receptacle without requiring additional wiring. We must, of course, comply with the WPB rules.

**Q.** No. 6—"If he needs three or four plugs according to 2110,



★ FIRE PROOF  
★ RUST PROOF

★ CORROSION PROOF  
★ SHORT PROOF  
★ SHOCK PROOF

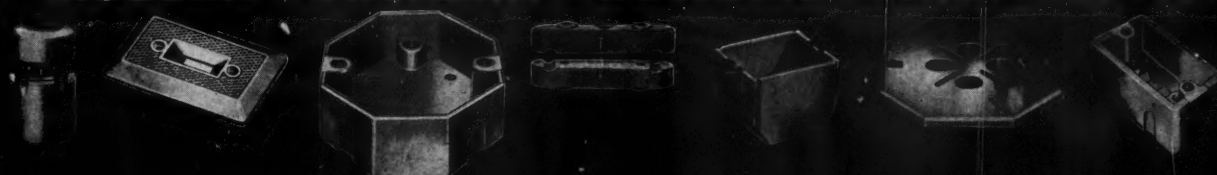


*Consider the*  
**ADEQUACY,  
DURABILITY**  
*and*  
**ECONOMY OF  
PORCELAIN  
AS YOU PLAN  
TODAY'S WIRING  
JOBS . . . . .**

● Modern Porcelain Protected Wiring is widely recognized as a fully safe and most reliable wiring method. It has proved its practicability over an exceptionally long period of time and has progressively developed and modernized until today it is the system which fully provides for greatest efficiency, adaptability, permanence, and economy. In addition, there is the ADEQUACY of PORCELAIN you can figure on for today's war workers' homes and commercial wiring. It is therefore the logical system for the electrical industry to specify and use on every job, not only to conserve vital metals but to make possible a better wiring system for customers after the victory effort is over, one that will assure liberal adequacy, capacity, and ample factors of safety.

"Prohibited Items for Construction Work"—a directive issued by the Army and Navy Munitions Board and made applicable to all construction by WPB, gives a list of prohibited items, the use of which will not be permitted except under special circumstances. It requires the use of Knob and Tube Wiring (Porcelain Protected Wiring). PORCELAIN for Porcelain Protected Wiring is immediately available and is an important factor in today's efforts to conserve vital metals.

## MODERN PORCELAIN PROTECTED WIRING SYSTEMS



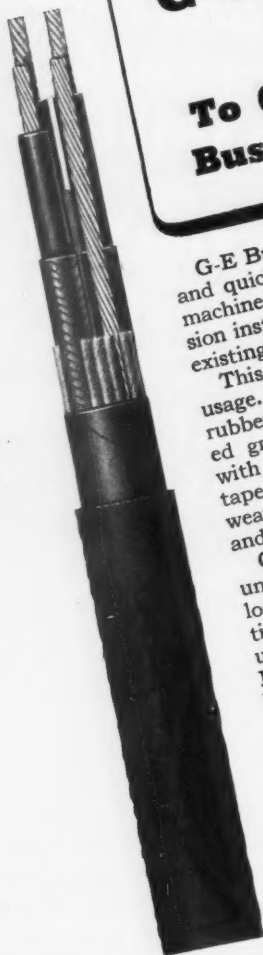
ILLINOIS ELECTRIC PORCELAIN CO.

★ KNOX PORCELAIN CORPORATION

★ PORCELAIN PRODUCTS, INCORPORATED



## Use Flexible G-E BUS-DROP CABLE To Carry Power from Bus Bars to Machines



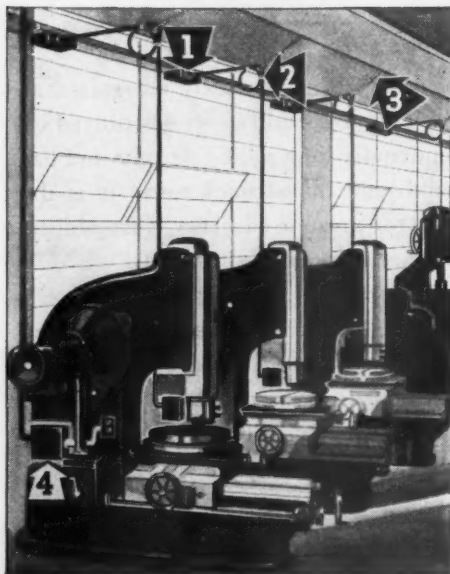
G-E Bus-Drop Cable can be hooked up easily and quickly from LVD or bus-duct systems to machines for new installations or for conversion installations. It is ideal for maintenance of existing bus systems too.

This cable is designed for long life and rough usage. It consists of three stranded conductors rubber-insulated and braided and a bare, stranded ground wire. These conductors are cabled with saturated jute fillers and presaturated paper tape. Over-all is a long-wearing, rugged LOOM weave that resists oil, grease, gasoline, moisture and flame.

G-E Bus-Drop Cable is made to stand up under vibration. It is neat in appearance and looks well in open wiring. For further information, see the nearest G-E Merchandise Distributor or write to Section W131-8, Appliance and Merchandise Department, General Electric Co., Bridgeport, Connecticut.

### TYPICAL BUS-DROP INSTALLATION

G-E Bus-Drop Cable can be run horizontally from service box (1) attached to bus, to a point (2) over machine. At (2) it is looped and supported from (3) by a spool-type porcelain insulator attached to a tension spring. It then drops vertically to control (4) on machine.



**GENERAL  ELECTRIC**

*Questions  
ON THE  
Code*

[FROM PAGE 50]

must he forego other outlets or can he comply with WPB limitations and still get approval for duration?

**A.** No. 6—He must comply with the WPB limitations but the matter of approval rests with the local Inspection Department. It would seem as though two receptacles would be sufficient for almost any bedroom, which would leave two outlets, one for the center light and one for a switch; or, as mentioned in our answer to Question 5, a combination switch and receptacle body could be used at the switch box, thus adding one receptacle without additional wiring.

**Q.** No. 7—"What is the current carrying capacity of No. 10—3 service cable and can it be used in place of No. 8—3 Romex or any number R.C., Type R wires with approval of N.E.C. for range circuits?"

**A.** No. 7—Three wire No. 10 service cable has a carrying capacity of 25 amperes, which, of course, is not as much as a 3 wire No. 8 non-metallic sheathed cable, or other No. 8 Type R wires. A 3 wire No. 10 service cable can be used to supply a range requiring not more than 31 amps. (See paragraph 2203e.)

**Q.** No. 8—"If, in installing three No. 6 and two No. 12 in 1-in. conduit is this in violation of 40 percent rule for service and water heater circuit when meter socket and time switch socket are set one above the other in the conduit run?"

**A.** No. 8—Three No. 6 and two No. 12 Type R wires require 1½-in. conduit.

**Q.** No. 9—"One No. 6 is bare; is this counted or does it come under No. 6 on page 304, Chapter 10 of 1940 Code? If so, could three No. 4 (two R.C. and one bare) and two No. 12 R.C. be run in 1 inch conduit in service runs?"—R.J.R.

**A.** No. 9—Note No. 6 (on page 304), following Table 2, is used only in computing carrying capacity and is not used in figuring conduit size. Even with one bare No. 6, two Type R No. 6 and two Type R No. 12, a 1½-in. conduit would be required under the 40 percent rule.



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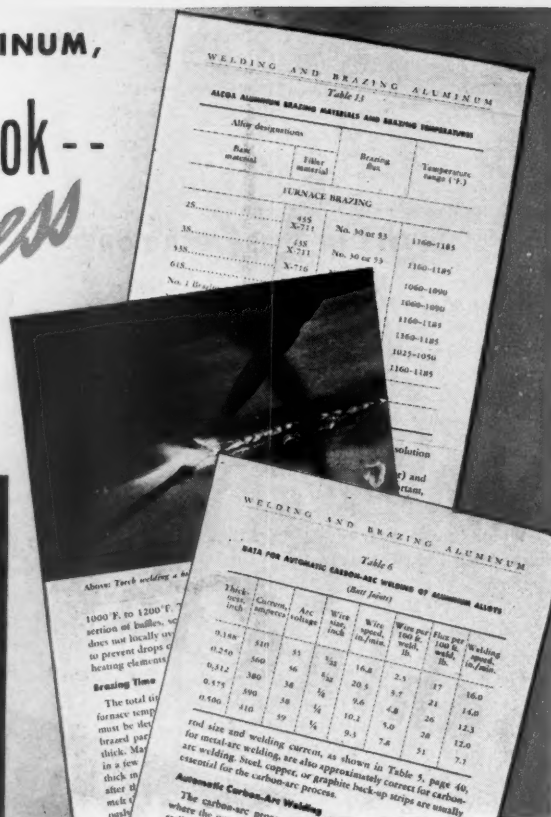
**ARROW ELECTRIC DIVISION**  
ARROW-HART & HEGEMAN ELECTRIC COMPANY, HARTFORD, CONN.

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# Industrial Electrification

## FLEXIBILITY

**W**AR is setting up some odd problems. At one time the relocation of machinery in the development of production lines to produce new models or changed designs was an orderly procedure affecting individual departments at rare intervals.

The constantly changing war theaters, shifting emphasis from one product to another and the trial by fire of designs and their consequent changes are forcing radical changes in production lines on "urgent rush" schedules. After converting from peace time products to war material, management is facing periodic reconversions at close intervals.

And each change means a new burden on the wiring system and a new responsibility for those in charge. Each change in each plant is pretty much a unique problem. There are few hard and fast rules that are universally applicable.

The accompanying article and guide sheet gives, in considerable detail, a review of methods for quick change wiring that will be found applicable to most of the specific problems encountered.

### Previous articles covered—

- Eliminating Causes of Severe Service Conditions
- Providing Adequate Capacity for Increased Demand
- Electrifying Operations to Reduce Unit Costs
- Safety Protection for Electrical Operations
- Increasing Flexibility of Electrical Service
- Electrical Aids to Automatic Control
- Electrical Ways to Reduce Waste How to Save Power
- Protection Against Sabotage
- Improving Working Conditions
- Electrifying for Continuous Operation
- Electrified Plant Housekeeping
- Electrical Problems Under 168 Hour Schedules
- Electrical Aids to Plant Conversion
- Electrical Aids to Quality Control
- Electrical Aids for Green Help
- Codes in Wartime
- Grounding for Safety
- Air Raid Restoration
- Operating Replacements
- Preparing for Blackouts
- Wiring for Quick Changes (this issue)
- Future articles will discuss—
  - Welding in Industry
  - Salvaging Electrical Equipment

## WIRING FOR QUICK CHANGES

**H**OW to wire for quick changes is a problem confronting companies who may be required to shift overnight from one job to another. How best can a wiring system be developed so that machines may be relocated, new machinery added, and loads stepped up, all on short notice? It is not a case of temporary wiring, but rather of how to reconnect permanent machinery quickly.

Obviously, an ideal scheme for quick change would be to have every piece of apparatus equipped with a cord and to have outlets of ample capacity all over the place. It's only an idea, but it has the key to the solution of the problem.

The first essential is a thorough knowledge of any system. Without that, how can anyone be sure that a machine can be connected? Having the complete picture enables one to install machinery quickly and without disturbance. It is necessary to know all about feeder ratings and fuses, and just how much starting current a particular circuit can stand.

### New Plants

Consideration of new systems should help point the way with older plants. Today, factories are being equipped with transformers at the load centers, stepping down the primary supply to the utilization voltage. Feeder breakers at these transformers supply short busways. Busway interconnections are installed to properly distribute load or overcome interruptions on a primary feeder.

Typical of modern practice are 460-volt feeders used for power and also to directly supply 265-volt fluorescent lighting. Busways make power and light available by simply inserting a plug where and when needed. They

also allow for machinery relocation without interruption, have high transmission efficiency, and give protection against damage. For example, in a new wood-working plant, a busway was mounted at the ceiling directly beneath the main work floor. So located, the busway was extremely close to the machinery on the floor above. By the provision of numerous holes, or spaces for holes in the floor, bus taps can speedily be extended through the floor to new machine locations. Furthermore, such a layout avoids all drops from the ceiling which may be in the way of hoist operations.

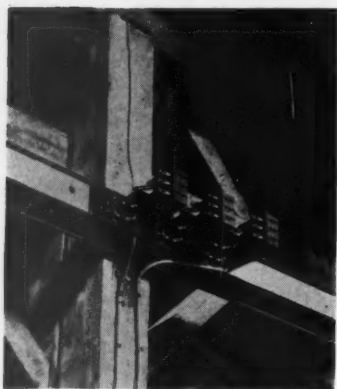
### Wiring Survey

The more data that is on record about any system just so much faster can it be converted to new purposes. For example, a simple step toward this end is identification of conductors, by color coding or tagging. While this may sound elementary, recently a plant had to be shut down before feeders could be

*SERVICE CAPACITY has been augmented in this plant by paralleling these four distribution transformers. By keeping the transformers near load centers long low voltage feeders are cut and voltage drops in lines are minimized.*







**CLOSE-UP** of flexible electrical distribution system showing plug outlets open for inspection. Such applications enable machines to be set up just where needed, and in double quick time.

segregated. Six identical unmarked feeders had been routed through one pull box, and one was to be rerouted. Tags attached during the original installation would have allowed the change-over to proceed without interruption.

Where is there spare capacity in a system? Are switches running warm under present loads? Are cables good for more current? Incidentally, that troublesome question of what constitutes continuous operation has at last been defined. It is operation where the load exceeds three consecutive hours or six non-consecutive hours at maximum rated load during any 24-hour period. This applies to insulated conductors. It is maintained that a cable is not earning its keep unless it runs warm during these days of scarcity. Knowledge of safe loading will avoid loss of apparatus, while lack of that knowledge may lead to playing safe with resultant uneconomical use of facilities.

To facilitate change-over, all available larger equipment should be listed. Motors should be classified by horsepower, speed etc. Transformer data should include taps. Controller data should include possible range of thermal units. This latter point is important in view of reports that about 35 percent of electrical fires originate with motors. Safety must not be lost in hurried conversions.

#### Service Entrance

A method that has interesting possibilities for quickly increasing service capacity was recently employed on a fairly new switchboard, which was rapidly overloaded. This 2000-ampere, single bus fed by a 2000-ampere main breaker at one end was carrying 2300 amperes. To relieve this overload, another main 2000-ampere breaker and separate service was connected to the

other end of the bus, giving a switchboard capacity of 4000 amperes without having installed any additional bus work.

Another method of increasing service capacity would be to use separate service switches for the new loads, without disturbing existing service facilities. To augment capacity, several transformers in parallel could be provided, so that the loss of one unit would not necessarily cause a complete shutdown. Smaller units give greater flexibility.

At switchboards, the most useful provision to speed changeovers is at least one larger capacity feeder switch. It is more useful than a group of small units. While its capacity can always be divided, the full rating might be required to start up some new heavy load.

Energy rates are factors in any layout. The best basis is to buy all requirements through one meter, if such a schedule is available and advantageous. Separate rates for power, lighting and heating call for separate systems, an inflexible arrangement to start with, resulting in duplication of systems, loss of diversity in loads, and complications during change.

#### Connections

Each plant should standardize on a few wire sizes to speed change-overs by simplification of stocks of connections, cable mountings and necessary tools.

When it comes to splicing, use solderless connectors. Wrap such joints with varnished cambric before applying the rubber and friction tapes so that joints will come apart clean, thereby saving reinstallation time during changeovers.

How can the most be obtained from old equipment? A fundamental and simple precaution is to keep connections tight, yet it is often overlooked. Cable heating might be lessened by taking another turn on a solderless lug. For example, a line of sewing machine operators complained of intermittent speed reductions. The supply voltage and frequency were O.K. The trouble was found at a loose internal connection of an old starter.

#### Wiring Methods

The sectionalization of feeders is very helpful when it comes time to relocate loads. Short feeder sections plus tie circuits make it easy to redistribute load.

To supply two or more floors from one feeder presents an awkward situation when changes have to be made on only one floor. It's better to keep floors separate where changes are likely to occur.

The paralleling of feeders is usually worthwhile, as discussed further on, but

the disadvantage is that any disturbance is shared by the feeders. For example, two No. 4/0 feeders were parallel to supply a power and light load with a voltage drop on elevator starting of 10 volts. This lighting fluctuation was intolerable, and was reduced to three volts by the separation of the feeders.

When extra capacity is needed and new materials are not obtainable, feeders can be made to transmit extra power through various methods. Transformers can be inserted to boost the feeder voltage. Circuit characteristics might be changed and power boosted 50 percent by converting two 2-wire feeders into a 3-phase, 4-wire system. Where rubber-insulated conductors are unavailable, weatherproof braided or bare wires might be installed as grounded neutrals to convert from 2- to a 3-wire system.

For rapid changes, obviously feeders must be accessible, which spells accessible methods of wiring.

Where building construction and occupancy dictate enclosed wiring, wireways with plenty of knockouts make a suitable system giving complete access to conductors. Insulated gutter taps feeding two ways speed up connections in wireways. Their use does away with the insulation damage caused by some soldering methods.

Open wiring on insulators has advantages of material savings and flexibility—extensions and rearrangements can be readily made. Cables can be worked at high current densities consistent with required regulation. It should, however, be installed out of harm's way.

A recent article drew the conclusion that to secure the best results with open wiring, multiple circuits in triangular formation should be used where possible, particularly where conductor sizes of 500,000 CM and above would ordinarily be required. The conductor spacing



**DETACHABLE** lighting units serve the need of wiring for future changes. This lamp lowering hanger simplifies servicing of unit by simply disconnecting the canopy plug. Photo, The Thompson Electric Company.

# WIRING FOR QUICK CHANGES

## *Things to be Considered*

### **SYSTEM DESIGN**

Should high-tension feeders be run to new load centers?  
Would busway or trolley systems be worthwhile in production areas?  
Would a local 120/208-volt, 3-phase, 4-wire system be an advantage for serving combination power, lighting and heating loads?  
Would present rate still be the best one if load increases?

### **SERVICE**

How much more load could safely be carried without adding to service equipment?  
Are there spare service switches available for added load?  
Are service transformers suitable for parallel operation, to thus obtain benefit of load diversity?

### **SWITCH- BOARDS & PANEL- BOARDS**

Where would a new switchboard be set up?  
Could a spare board be built up for use during conversions?  
What feeders might be tied together on one switch to make spare positions available for expansion?  
Could fused neutrals be eliminated?

### **CONDUCTORS**

How much more current could be carried by the various feeders?  
Could circuits be paralleled or looped to advantage?  
Where could tie circuits be installed between feeders?

### **TRANSFORMERS**

Are transformers equipped with thermometers to show loading?  
Are multi-connection units on hand to obtain various voltages for possible use on hurried conversions?  
Should small units be installed for watchman lighting to save losses of large regular units?  
Do transformers have any taps for voltage regulation?

### **LIGHTING**

Should lighting be supplied from power circuits through transformers or by direct connection thereto?  
Should units be made detachable for ready relocation?  
How could temporary lighting be obtained while changes are being made to regular circuits?

### **EQUIPMENT**

Just how much connected horsepower is now supplied? Have all loads been listed?  
How about feeding single-phase loads from polyphase power circuits?  
Could capacitors be relocated as need be?  
Are switches running hot under present loads?

### **GENERAL**

Has identification of conductors and equipment been completed?  
Would additional power receptacles be worthwhile to help get new motors going?  
Are there sufficient stocks of fuses, both regular and time-lag, also connectors and the like?  
Have changeover crews been adequately posted on plans?  
Would additional tools or instruments speed up work of conversion?  
Are fittings, conductors, etc., on hand for rapid installation of new open-wiring feeders?

should be reduced to the fullest extent consistent with good engineering and construction.

For quick economical expansion interlocked-armor varnished cambric cable is available from 600 to 5000 volts, No. 14 to 500,000 CM. It is easily installed, and saves vital conduits. Its high V-C temperature rating makes it good for large currents. Not only is it easily installed, it is just as easily removed and reinstalled practically without waste. Armored cable appears to have sound applications, especially where quick changes may be needed as load centers are shifted overnight.

### Branch Circuits

Bus drop cables are available for use between busways and machines. They come complete with grounding conductors. Such cables lend extreme flexibility to machinery relocation in contrast to rigid conduit jobs.

A method of restricted worth to make one circuit do the work of two is that of using a double-throw switch. Normally such restriction is poor business. However, in these days of shortage, the double-throw scheme might prevent needless circuit interruptions. In the making of quick changes, it might be possible to pair machines which are seldom used, and thus avoid the expenditure of materials.

An idea of considerable merit to gain additional circuit capacity is to install, if available, thin-wall insulated conductors as replacements for standard wires. The same conduits can thus be made to contain greatly increased amperages.

### Equipment

For quick change-over, purchase standard equipment and stick to readily interchangeable materials. A plague of our industry is the needless variety of equipment for accomplishing the same purposes.

Purchase completely factory-assembled units wherever practical. Competent help is too scarce for field assemblies. An example is the combination disconnecting means plus motor controller all in one case. It is so much easier to mount and connect such a unit assembly instead of nipping boxes together.

Another example of how machinery is being made self-contained for speedy relocation is the 480-volt machine tool complete with air-cooled transformer to supply the local light and plug receptacle on the machine.

Transformers filled with non-inflammable liquid may be placed indoors without a vault and thus reduce installation time and cost. They can,

therefore, be readily reinstalled as load centers shift.

Oil-filled transformers may need to be overloaded occasionally for the duration. If so, equip them with temperature alarms, also air blast or water spray cooling may be resorted to.

Capacitor banks complete with control switches are available all on one frame. Their portability makes them particularly useful for relieving overloaded feeders as sudden low power factor load growth might necessitate.

Detachable fixtures speed wiring change-over. One factory being erected is to have all apparatus fed from open-wiring through locking-type polarized receptacles and cords. In this case, the factory will be erected while the actual machinery arrangement is still undecided.

Detachable lighting units will serve the need of wiring for future changes,



**TIME-DELAY RELAYS** can keep motors on line if a power interruption is less than four seconds. They also allow heavier motor starting current to flow than can be carried by ordinary devices.

as well as facilitating proper fixture cleaning by simply disconnecting the canopy plug.

Trolley duct is sometimes used for lighting distribution to make it possible to group lighting units and later respace them. High voltages are conserving copper. The 150-volt limit on lighting installations no longer applies to industrial establishments where the fixtures are not less than eight feet from the floor and do not have individual switch control. This system is built around the use of 265 volt fluorescents supplied from a 460-volt, 3-phase system.

A phase-rotation tester is a mighty handy little instrument on change-overs, enabling one to connect motors for proper rotation at the outset.

The most useful conversion instrument is probably the clip-on ammeter.

It allows loading to the limit of a conductor.

Good tools are essential to speedy orderly change. Included might be demountable adjustable stagings and tripods for the removal and replacement of motors, trucks for conveying apparatus easily, electric drills and similar hand tools to avoid, if practical, any manual work.

There's the familiar story of how the shoe and finally the battle was lost for want of a nail. The same is true of change-overs. An adequate supply of spare parts is essential to save time.

Standard fittings are best. Threadless fittings are time savers, and facilitate erection of otherwise awkward threaded assemblies.

### General

Fuses of the time-lag variety are handy to have for change-over work. Such fuses allow heavier motor starting current to flow than can be carried by ordinary fuses, and this could result in a smaller switch handling a job than otherwise necessary.

Fabrication methods can slow down work as in the case of an infra-red assembly of angles and metal raceways all welded together, which was splendid until it had to be dismantled for relocation.

Extra working space around switchboards and panelboards saves time when hurried alterations are underway.

Spare panelboard circuits save time by allowing for the connection of the new before the old stuff is removed. For quick connection, plug receptacles can be built into the side walls of panelboards. A spare portable panelboard is a very handy piece of equipment for any maintenance or change-over crew.

Change-overs can be made piecemeal or complete, but material shortages are going to force out the liesurely transition often requiring maintenance of duplicate systems during changes. The complete change at one interruption demands full preparation plus a thorough knowledge of the system. Good materials help too, as they avoid the lost time of fussing around with poor mechanisms. Oversized control apparatus and manual switches are worthwhile in preventing failures from working parts too close to their limits, provided that such apparatus is not a waste of our country's precious facilities.

Over and above all other considerations, rewiring must be installed safely. Haste need not mean waste provided that equipment is installed in a workmanlike manner, complicated wiring avoided, circuits properly fused, and motor overload devices wisely used.



● Two horsepower Century Splashproof motor driving a centrifugal pump.

● Century ten horsepower Squirrel Cage motors driving lubricating pumps in a rolling mill.

● Century forty horsepower Squirrel Cage motor driving a five-stage high pressure water pump.

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Electrical Contracting, January 1943

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## A SHOCK for Mr. Hitler

**T**HIS is no mere play on words. Ours is a war of production... of armaments, of guns, of ships, of war materials. It is a war of speeded-up manufacturing... of machines and machinery.

And back of machinery is power... electric power that keeps production humming. Truly, the crushing blow that will eventually bring the Axis to its knees will come from the power of electricity as much as from the power of explosives. Yes, the stunning effect of this electrical power may well be called "a shock for Mr. Hitler".

Where is it coming from? Whence this gigantic massing of electric power from the Nation's generating plants? Whence the supply to meet the pyramided demand for wires, cables, switches, terminals... the thousand and one items that go into the making, transmitting and using of electrical power?

It came out of the teamwork that is the American

way of doing things. The power companies threw into it their ready-and-waiting plans for plant expansion—for interconnection of systems, for unleashing their pools of power. The electrical manufacturers came through with increased production. The electrical supply warehouses looked after the distribution of equipment to meet the time schedules.

And back of it all, Washington guided, coordinated and applied the pressure where needed. To the War Production Board must go a lion's share of the credit. For the miracle has been wrought. Wherever a machine was installed in America's far-flung war-production line—there the wiring and the power were ready and waiting to start the wheels turning.

The Electric Power in back of American industry packs a wallop—an electrical wallop—a terrific "shock for Mr. Hitler".

# GENERAL CABLE CORPORATION

*Manufacturing Plants from Coast to Coast*



1942, April, No. 2, Page 1

WIRE AND CABLES FOR EVERY ELECTRICAL PURPOSE

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Armies of skilled electrical contractors out on the industrial firing line, installing the wiring for constantly expanding production—guns, shells, tanks, ships, planes! . . .

Men, pledging their skill to keep every electric installation in A-1 maintenance condition.

# Reader's QUIZ

QUESTIONS from readers on problems of industrial equipment, installation, maintenance and repair. Answered by electrical maintenance engineers and industrial electrical contractors out of their experience. For every question and every answer published, we pay \$5.00.

## TWO MOTORS FOR HEAVY LOADS

**QUESTION 80.** Two motors of the same speed and horsepower but different make are connected by belt drive to the same line shaft in order that only one motor need be used for light loads if necessary. On heavy loads both motors are used but one always pulls more than its share of the load. What is the cause and remedy for this?—J.J.L.

**A.** TO QUESTION 80. While both motors may have the same nameplate speed and horsepower rating, they probably do not have the same design and operating characteristics. In order for the two motors to divide the load properly, it would be necessary for them to have the same operating characteristics, particularly the same slip constants at maximum output and at maximum torque.

It would also be necessary for you to have the same size driving pulleys and driven pulleys. The belt slippage would also have to be the same.

For the remedy, I would suggest individual drive for the machines that are in operation the most with the line shaft serving the balance of the load. It might also be possible and practical to divide the line shaft into two sections with a motor for each section.—V.M.

**A.** TO QUESTION 80. There are several things that could cause this. The slip of induction motors varies. This is the per cent of the motor drops below synchronous speed at full load. The per cent of slip could be 2 to 10 per cent depending on what kind of drive the motor was designed for.

Standard motors can have 2 to 5 per cent slip. On a 1200 rpm. motor this would be 24 to 60 rpm. One motor has 2 per cent slip and running at 1176 rpm. at full load, the other at 5 per cent slip or 1140 rpm. at full load. The motor running at 1176 rpm. would take more than half load as it was running faster. This is most likely what is happening. To improve this, reduce the belt speed of your motor taking more than its share of load by reducing the size of the driving pulley or increasing the size of the driven pulley or increase the belt speed of the underloaded motor. Before doing this check the rpm. of each motor at full load when operating alone. Also check the belts and pulleys as some have a lot more slip than others.—W.L.C.

**A.** TO QUESTION 80. The two motors of same speed and same horsepower, but of different make which do not divide the load equally when belted to the same line shaft, apparently do not have the same speed-torque characteristics. As the load increases, the speed generally decreases. If with one the speed decreases more rapidly, it will carry less load. The motors will divide the load till each supplies the torque corresponding to the resulting speed.

The remedy is to decrease the diameter of the pulley on the motor which is too heavily loaded. The decrease should be slight and after a few trials it should be possible to divide the load correctly.—J.E.W.

**A.** TO QUESTION 80. The only condition under which two motors can be connected by belts to take care of a light load with one motor and a heavy load by using both motors, without overloading one motor, is by using two motors which have identical

speed characteristics at all loads at the point of contact with the load. Motors do not have to be of the same horsepower rating. However, by increasing the size of the pulley of the motor carrying the light load, you can get relief in most cases. This can be accomplished by gluing cloth or leather on the pulley until the load will become even. Also, the belt tension can be manipulated as well as the belt length of both motors to increase the slip on the low slip motor and to decrease the slip on the high slip motor.—H.S.

## GROUNDING

**QUESTION 81.** With 220 volt equipment where one phase wire or one point of the circuit is grounded, an insulation failure to the motor frame should result in opening the over-current protective device if the frame is grounded. With the 440-volt equipment there is no ground connection on the circuit. The result is that the frame may remain alive and an accident may occur. What feasible precaution may be taken? We realize that proper maintenance, cleaning and checking are important but wonder if any specific remedies have been devised.—J.E.W.

**A.** TO QUESTION 81. It seems to me this question is resolvable into two parts; first, how can one know when an insulation failure to ground has occurred and second, what safety precautions can one take toward preventing a motor, metallic raceways, other apparatus and their enclosures, being energized to a hazardous voltage when insulation failure occurs?

Answering the first part: If the power system is ungrounded a lamp indicator such as Fig. 1 or an indicating ground

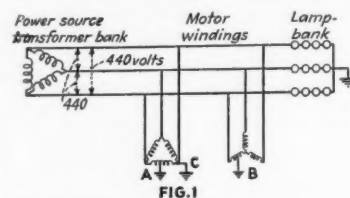


FIG. 1

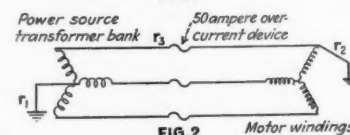


FIG. 2

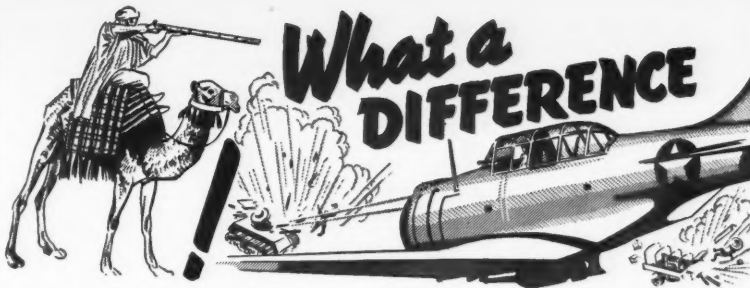
detector or a contact operating ground detector relay may be purchased and installed on the power system. The ground indicator should be located where it will be under frequent observation



such as on an attended switchboard, over the Chief Electrician's desk, in the electric shop, in the office, etc. Likewise, a relay actuated alarm should be located where it always will be seen or heard. If the power system is grounded, a ground current relay may be installed in the system grounding conductor. The contacts of such a relay may be connected to an indicator, to an alarm or they may be connected to open the service or main circuit breakers. Answering the second part: The National Electrical Code states all exposed, non-current carrying metal parts of and conducting materials enclosing or forming a part of electrical equipment must be *effectively* grounded. This is essential if shock hazard is to be avoided.

If a power system is fed from a transformer bank having a phase or neutral point grounded, both this point and the motor frame will have to be *very effectively* grounded to cause an over-current device of even moderate size to open. For instance, referring to Fig. 2, assume a 440 volt, 3 phase power system fed from a "Y" connected transformer bank with the neutral grounded, a 50 ampere over-current device in the circuit, a transformer neutral connection to ground resistance,  $r_1$ , of 1.0 ohm, a motor frame to ground resistance,  $r_2$ , of 10.0 ohms and a conductor resistance,  $r_3$ , of 0.01 ohms. Current flowing through the insulation fault, shown as a ground on phase conductor A, must flow through resistance  $R = r_1 + r_2 + r_3 = 1.0 + 10.0 + 0.01 = 11.01$  ohms. The voltage,  $E$ , to ground of phase conductor A causing this current to flow is 254 volts. Substituting in the equation  $I = E/R = 254/11.01 = 23.1$  amperes. Unless considerable load current is flowing through the over-current device, the current  $I$  will not open that device. (Even assuming  $r_2 = 5.0$  ohms making  $R = 6.01$  ohms,  $I$  would equal only 42.3 amperes.) If one of the phase conductors of a 220 volt or 440 volt system is grounded, the voltage to ground,  $E$ , should be changed from 254 to 220 or 440 volts respectively. It is evident from the above example that, if a power system is to be grounded with the idea that faulty insulation to ground will open over-current devices, better grounding must be obtained both on the power system and at the motors or raceways, apparatus, enclosures, etc., than it usually is possible to obtain in practice.

Consider the "safety" feature of grounding a power system. Using the data assumed above, to what voltage will a motor frame be energized if insulation failure to it occurs? Let  $e$  represent the voltage to which the motor frame will be energized. Then  $e = I r_2 = 23.1 \times 10.0 = 231$  volts. In other words, although a 50 ampere over-current device probably would not open



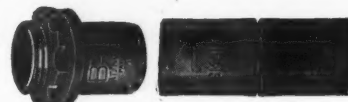
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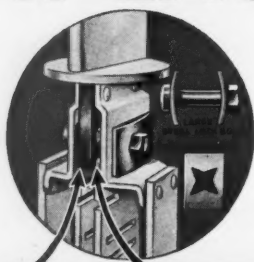




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## Reader's QUIZ

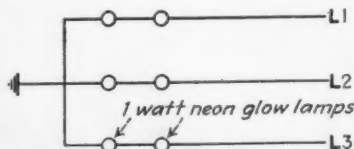
[FROM PAGE 63]

under these conditions, the motor frame will be energized to 231 volts above ground creating a very serious shock hazard. (Even assuming  $r_2 = 5.0$  ohms,  $e = 42.3 \times 5.0 = 211.5$ , likewise a very serious hazard.) I consider the assumed resistances to ground are not higher than will exist in most cases; in fact, they probably are lower than will be found to exist in many cases, especially when threads, locknuts, and screw connections of a metallic raceway system are depended upon as the ground circuit for motor frames, apparatus, enclosures, etc.

For the reasons exemplified above, I consider grounding power systems, for the purpose of reducing shock hazard, frequently creates more serious hazards than might otherwise exist. Leaving power systems ungrounded and immediately clearing each case of faulty insulation to ground indicated by a ground detector seems to me a much safer practice. One can calculate the actual currents and the actual voltages to ground that will obtain on any system by using the actual values of  $r_1$ ,  $r_2$  and  $r_3$  that exist.

It seems to me advisable to install lightning arresters on power systems between the phase conductors and an effective ground. Then, in case of insulation failure between windings in a transformer, which I realize is a rare occurrence, or in case of lightning or other surges, the arresters will discharge to ground and prevent the power system voltage rising excessively, protecting both persons and equipment. The lower the 60 cycle and impulse breakdown voltages of the arresters and the smaller the IR drop across the arresters the better protection they will afford. —P.O.L.

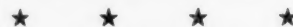
**A.** to QUESTION 81. The answer to this question is to ground the frame of the motor thoroughly. While this will have no effect on your overload tripping device it will show on your system ground detector. If no ground detector is used a simple hook-up is as follows:



When a ground occurs on any of the three phases the lights on that phase

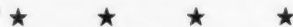
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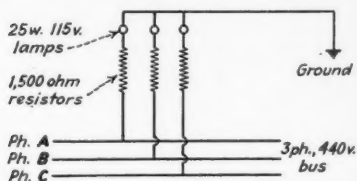
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will go out and the other two phases will glow brightly.—L.H.

**A.** to QUESTION 81. On a 3 wire, 3 phase, 440 volt under-ground system there should be a ground detector on the switchboard as a safety measure. This can be done by using three resistors and three lamps as shown in sketch. In operation the lamps would



all glow with equal brilliance. In the event of a ground on phase A the lamp on this phase would go out and the remaining two would glow brighter —G.P.B.

**A.** to QUESTION 81. Section 2514 of the 1940 National Electrical Code permits grounding of 440 volt circuits. Fig. II, p. 338 of the Code shows a practicable connection which illustrates the protective requirements given on p. 327.

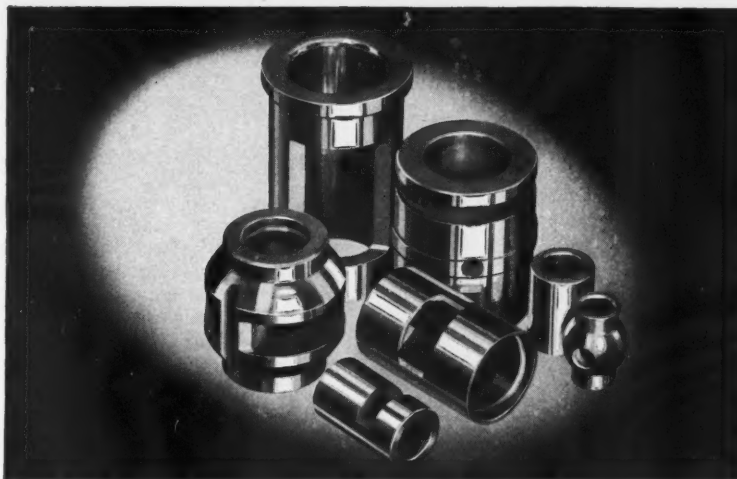
At least one nationally known industrial concern has standardized all 44' volt connections according to Fig. II cited above. No fuse is permitted in the grounded phase in the disconnecting switch. The holding coils of all magnetic starting switches are connected to the grounded lead. Also it is the practice to have the grounded phase occupy the center position in the three-phase switches.

Advantages claimed for this connection are (1) limitation of voltage in case of insulation failure, (2) tripping of protective devices when accidental grounds occur, (3) eliminating starting of a motor if pilot wire to push-button control is accidentally grounded, and (4) simplification of control equipment.

Naturally, for safety of maintenance men, convenient and easily accessible disconnecting means must be provided. —L.E.B.

**A.** to QUESTION 81. An ungrounded 440-volt distribution system may develop a ground in a piece of equipment and the over-current protection device will not open the circuit if that is the only ground in the system. However, if the N.E. Code requirements are met as set forth in Section 4436, there will not be any danger of injury to a person as a result of an accident. Paragraph D of Section 4436 states, "If the motor operates with any terminal at more than 150 volts to ground, the frame shall be grounded."

Some types of ground detectors will



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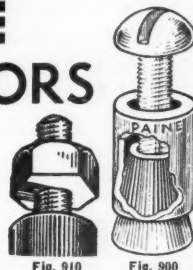


Fig. 910

Fig. 900

### LEAD EXPANSION TYPE

Fig. 900—Machine Screw Type available in standard diameters from 6-32 to 3/8".

Fig. 910—Bolt and Nut Type available in 1/4", 3/8" and 1/2" diameters in standard lengths.

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## Reader's QUIZ

[FROM PAGE 65]

indicate such grounds as referred to above. However, a good inspection schedule by which each piece of equipment were megged regularly would show up a ground and minimize the danger of damage to equipment. Its only when the second ground develops in the ungrounded system that damage is likely to result to the equipment. The regularity of the inspections would depend on operating conditions, location, equipment, etc., the shorter the period of time between inspections the greater the protection to the equipment.—J.A.H.

### Can You ANSWER these QUESTIONS?

**QUESTION J3**—During a lightning storm, what would cause blue flashes and a snapping sound from metal light fixtures and main service switch? The ground is an eight foot copper rod and looks good. We have several homes in the country with this trouble.—W.L.C.

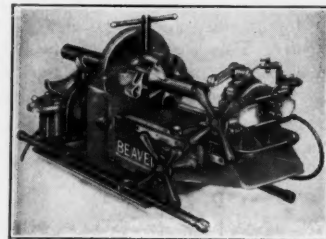
**QUESTION K3**—Why do power companies use a meter that is apparently the same as a three phase meter on a three wire, single phase service that is fed from a three phase, four wire wye distribution system?—E.M.O.

**QUESTION L3**—Our motors are rated to operate from 440-volt, 3-phase, 60-cycle power. We have fourteen  $\frac{1}{2}$ -hp. squirrel cage motors driving a flight conveyor system which we believe could operate safely at a considerably higher speed to carry more material. These motors never draw more than 80 per cent of rated full load current. It is proposed to operate the system on higher frequency power derived from two available 40-hp., 1760-rpm. slip-ring motors with 265-volt, 3-phase rotors. What ratio of pulley diameters should we use on the two motors to connect them with V-belts, and if a transformer is needed what will be the power and voltage rating required?—G.I.S.

**QUESTION M3**—In ordering busbar clamps why is it necessary to specify whether they are to be used on a.c. or d.c. and what would be the result if the wrong type were used?—J.J.L.

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YOUR ANSWERS BY FEBRUARY 1

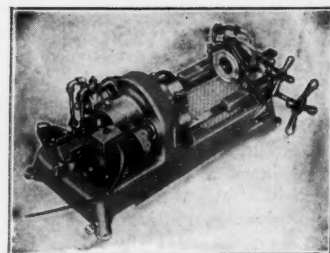
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Write for Bulletin A



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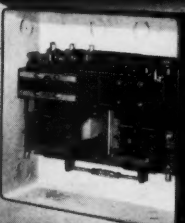


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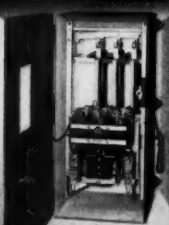
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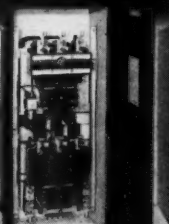
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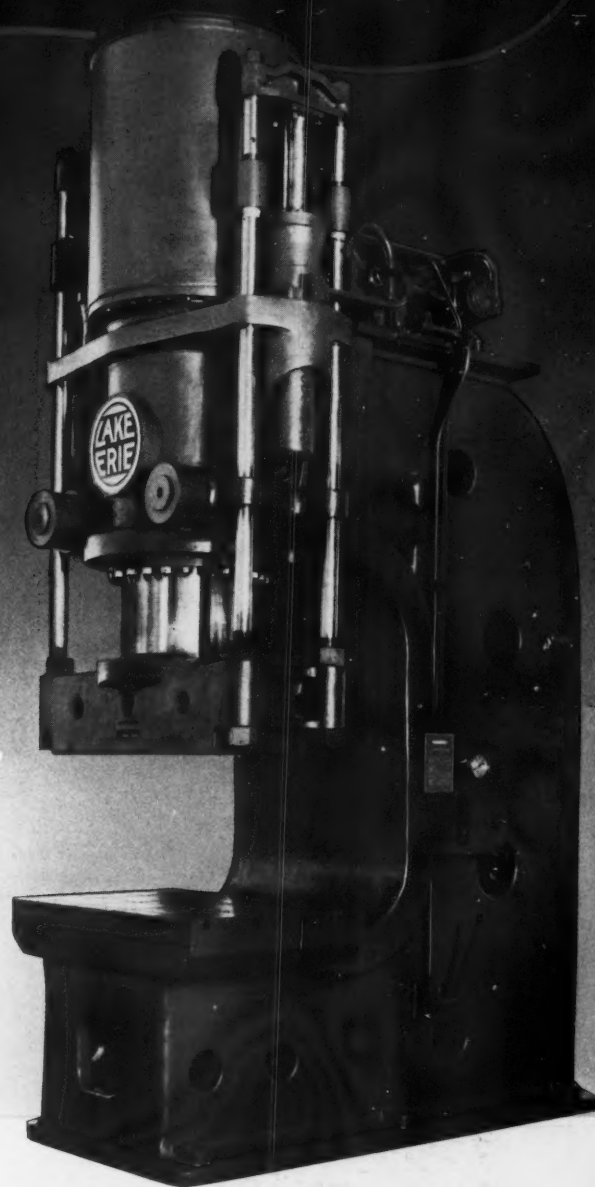


**AUTOMATIC RESIST-  
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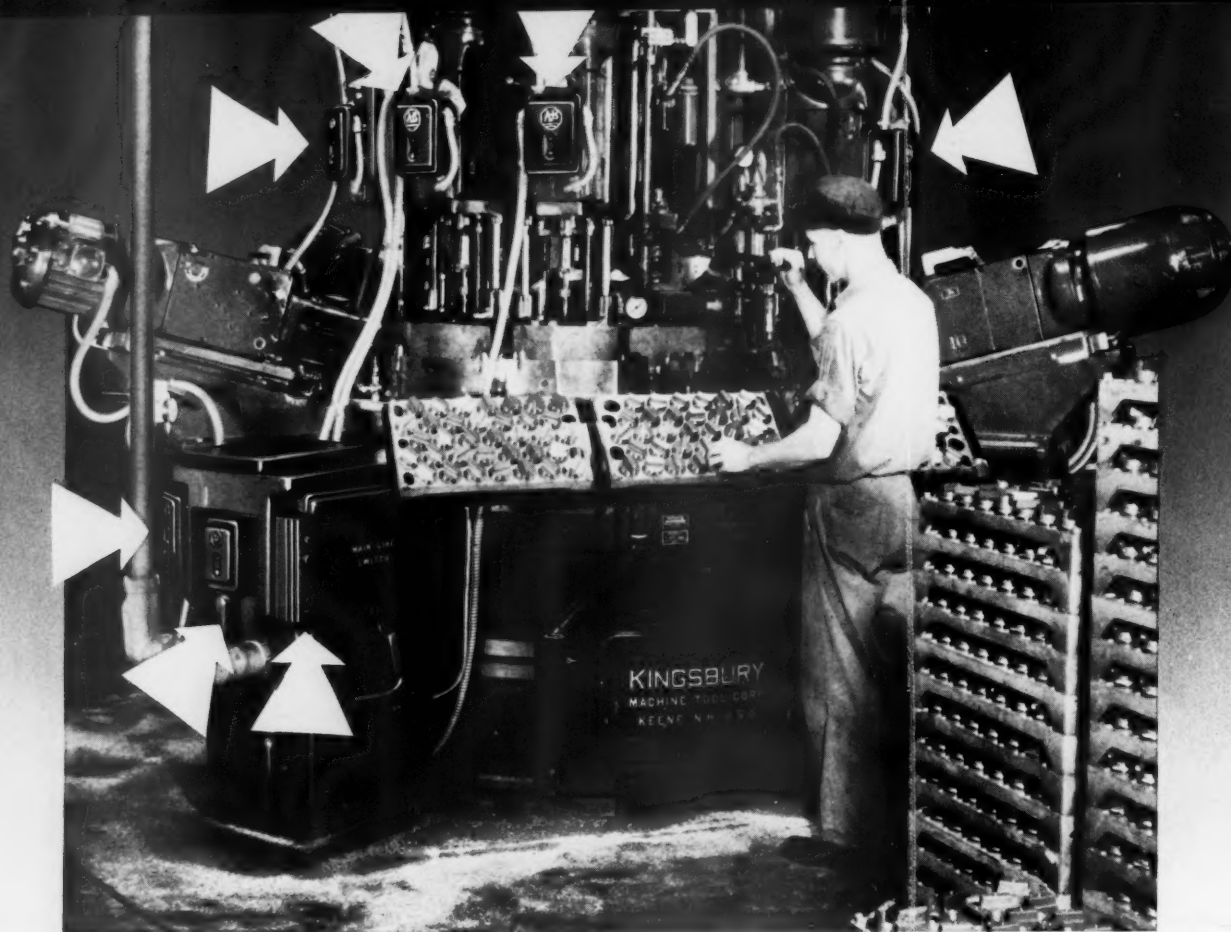
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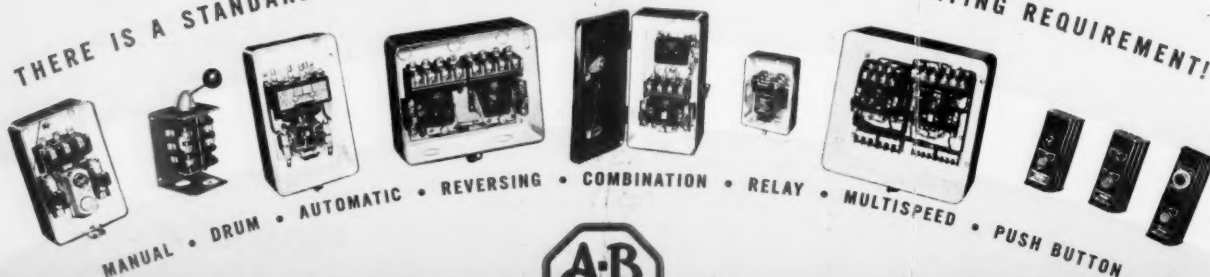
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# Motor Shops

## PORTABLE HYDRAULIC LOAD TESTER

An ingenious portable hydraulic test machine for making load and locked rotor tests on electric motors up to 100 hp. in size has been developed by Eugene Anderson, vice president, Anderson's Inc., Nashville, Tenn. motor service organization.

This complete unit has an overall length of six feet and is approximately four feet wide. The braking unit consists of a 1941, 1½-ton Ford rear end assembly complete with brake drums and hydraulic master cylinder equipment. The rear axle and housing were shortened so the brake drums now hug the differential housing. Load is applied to the brakes by a hand crank which operates the master hydraulic cylinder on top of the housing. A gauge attached to the cylinder indicates the load applied.

Alignment of the braking unit to the shaft of motor on test is accomplished by raising and lowering it on four steel shafts welded to an I-beam base. Four

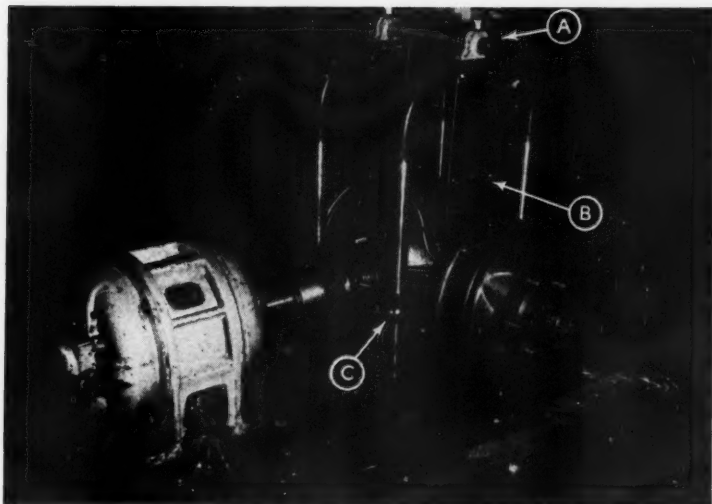
1-inch conduit elbows welded to the tops of the shafts form a support for a worm gear winch which raises and lowers the unit through a cable attachment. Four riser guide collars made from split couplings filled with babbitt metal provide perfect alignment. A tightening crank on each collar locks the unit at the desired level.

The motor base consists of four sliding rails to permit alignment in any direction. The motor shaft is connected to the differential shaft through a universal fabric coupling made of two hubs and bolt plates and a piece of 5-ply, 10-inch rawhide belting.

The original bolts and hubs for the double wheels are on the brake housing to provide for two additional brake drums in case more braking power is needed. An attachment for water cooling the brakes can also be added.

The complete unit is mounted on large casters to provide flexibility of movement. The test unit can be easily moved to the motor rather than shift the heavy motor to a test location.

Here, again, is a striking example of



**HYDRAULIC TEST** unit is used for load and locked rotor tests on motors in this shop. Alignment winch (A) aligns unit to motor; crank at collar (C) locks alignment and load is applied to brake drums by hand crank (B) at master cylinder.

American ingenuity as applied in our motor service shops. A few scraps of metal, a discarded truck differential assembly and a couple of ideas combine to produce a piece of test equipment that, under wartime conditions, would be difficult to secure. And it means better and quicker service for the customer.

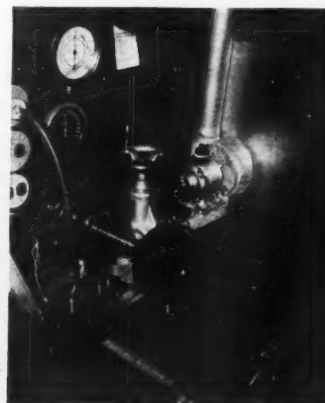
## BABBITT FROM SCRAP

Are you having trouble getting good babbitt for your motor repair jobs? If so, NISA has come up with a suggestion for securing some. It's simply this: buy up old automobile engine bearings, melt out the babbitt for your own use and sell the housings for scrap.

It may require a bit of leg work, but it's worth it if you're in a jam.

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A magnetic chuck, of the type used on some drill press bases, found its way into the small motor repair department of the Willey-Wray Electric Co., Cincinnati, Ohio. It was immediately put



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to work holding down motors during test runs on the eddy current dynamometer. All the fuss and bother of clamping down motors is now eliminated.

The 15½-in. by 10½-in. chuck plate is mounted to a movable base which can be raised or lowered by a hand wheel for aligning purposes. Electrical connections are made to a 110/220-volt, 3-wire circuit to provide two magnetic strengths for different sized motors.

Different sized motor shafts are coupled to the dynamometer shaft by



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Harvel 612-C dries internally to an infusible, non-thermoplastic state and will not soften or "throw out". 612-C bonds coils and windings into a compact, unit-acting mass. It bakes to a tough, firm, mechanically-strong film which has long life under severe operating conditions.

Harvel 612-C provides excellent insulation at normal and high operating temperatures and is especially recommended for use with Fiberglas insulation.

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Generally accepted for high temperature motor service, Varnished Fiberglas helps motors withstand overloading. When coated with a heat-resisting varnish, the inorganic base material has greater resis-

tance to heat than any other type of varnished insulation. The varnish on Fiberglas cloth gives added insurance against possible penetration of moisture and also permits a varnish-to-varnish bond when dipped. Available in 36" wide rolls, straight-cut tape and bias-cut strips.

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simplifying and speeding application. It is available in sheet or tape form ready to cut into slot strips. Irv-O-Slot insulation comes in nine types, ranging from the new thin non-bulking insulations for more confined areas, to heavier types for large motors.

Other Irvington Varnished Insulations which because of their quality add to motor life are:

**IRVINGTON VARNISHED CAMBRIC**—used for phase insulation and wrapping leads.

**IRVINGTON VARNISHED CANVAS**—used as a cushion on large D.C. motors between coils as field coil pads, where a heavy insulation is required.

**IRVINGTON VARNISHED SIC COTTON CLOTH**—a new thin varnished insulation used to replace silk.

**IRVINGTON SATURATED SLEEVING**—used to insulate leads.

For more information about products and application data on varnish, write dept. 96

# IRVINGTON

## VARNISH & INSULATOR CO.

IRVINGTON, NEW JERSEY, U. S. A.

PLANTS AT IRVINGTON, N. J. and HAMILTON, ONT., CANADA



*Motor Shops*

[FROM PAGE 69]

coupling bushings of various bores. These bushings are all clearly stenciled to indicate size and are compactly stored in a wood rack behind the chuck table.

A light above the load and r.p.m. indicators illuminates the meter board and is connected with the magnetic chuck to indicate whether or not it is energized.

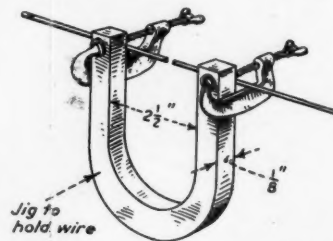
This latest device is another of the improvements the Willey-Wray Company have developed to speed up their motor repair work.

### STATOR WINDING

Necessity, in the person of WPB's restrictions on wire, is the mother of resourcefulness. An example of this is told by Frank Andrews, Andrews Magneto & Motor Works, Modesto, Calif., who went back years to an emergency job caused when lightning hit a 75-hp. 2200-volt motor and wrecked about 50 wires, for an idea to save copper wire and rewinding of a



**COTTON THREAD** from a piece of scrap wire wound over the brazed joint after painting with lacquer.



**CLAMPS** used to hold broken ends of wire together in jig for brazing.

75-hp. motor which came in. The rotor bars had broken loose from the end ring and cut off a number of wires in the stator winding. The winding itself otherwise was in good shape.

As there was little chance of getting wire for a complete rewind, Andrews decided to repair the broken wires

themselves by silver brazing them together. To do so he made a small U-shaped jig of  $\frac{1}{8}$ -in. wood, with a gap of about  $2\frac{1}{2}$  in. Each end of the broken wire was first cleaned thoroughly, filed to a flat taper, and the ends held together by the jig, using clamps to hold the wire, while the wires were brazed together with silver solder.

After brazing, the joint was painted with lacquer, and cotton winding from scrap wire wound over the joint. A small Presto tank torch was used to make the braze.

"Be sure to clean the copper well before brazing," warns Andrews. "Half the job of brazing is a clean joint to start with. Silver is a better conductor than copper. When no other silver is obtainable, flatten a silver spoon and cut it in long strips. Use a silver solder flux if you have it, or borax for flux in a pinch.

"This same method can be used to piece together wire to make a coil. The wire manufacturers use it to splice wire ends together, covering the joint with enamel and cotton, too. It makes a strong joint. Band saws are often spliced in this way. Silver is a better conductor than copper so the joint has no resistance if made clean.

"Where lead wires break off from the commutator of direct current motors this same method can be employed. In the case of the motor hit by lightning, some of the inner wires of a coil were damaged so we took the wedge out of the slot and removed the coil and pieced in new wire to replace that burnt out."



**PORTABLE LEAD POT**, supported by a tripod frame on a sheet steel disc equipped with casters, can be moved where desired in the shop of the Mielke Electric Works, Inc., Duluth, Minn. Unit is gas fired and can be connected by flexible hose to any gas outlet in the shop.

# FOR EVERY BENDING JOB

## there's a GREENLEE BENDER



**No. 770  
Rigid Conduit and  
Pipe Bender**



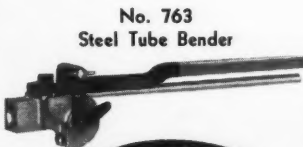
**No. 770-T  
Thin-Wall  
Conduit Bender**



**No. 770-BB  
Hydraulic  
Bus-Bar Bender**



**No. 760  
Copper Tube Bender**



**No. 763  
Steel Tube Bender**

### FOR FAST, EASY BENDING OF RIGID CONDUIT

Here's the Greenlee No. 770 Hydraulic Bender for fast, easy bending of  $1\frac{1}{4}$  to 3-inch rigid conduit and pipe. This powerful bender, with 25 tons of hydraulic power, will make smooth, accurate bends in  $1\frac{1}{4}$ ,  $1\frac{3}{4}$ , 2,  $2\frac{1}{2}$ , and 3-inch conduit or pipe without the use of heat or filler. Sturdily and compactly built into one unit, this bender is easily carried to the job and set up, will not move and twist about when in use, and is easily operated by one man. And for the larger size conduit there's the Greenlee No. 775 Bender with 40 tons of hydraulic power for easy bending of 3,  $3\frac{3}{4}$ , 4, and  $4\frac{1}{2}$ -inch material. Attachments available for these benders increase the range to include most types of conduit bending required in electrical maintenance and construction work.

### FOR $1\frac{1}{4}$ " TO 2" THIN-WALL CONDUIT

The No. 770-T Hydraulic Bender for bending thin-wall electric metallic tubing consists of the Greenlee No. 770 Power Unit with special attachments designed to make a full 90-degree bend quickly with one forward movement of the ram. To prevent crushing and kinking, the conduit is supported by a formed follow bar which moves with the conduit during the bending operation. The regular attachments for this machine, which will bend  $1\frac{1}{4}$ ,  $1\frac{3}{4}$ , and 2-inch thin-wall conduit, can easily and quickly be applied to the No. 770 Power Unit.

### BENDS BUS-BAR UP TO 4" WIDE, $\frac{3}{4}$ " THICK

The Greenlee Hydraulic Bus-Bar Bender has been designed to make regular U-bends, 90° bends, or offsets in any size bar up to 4-inches wide and  $\frac{3}{4}$ -inch thick. The bus-bar bending attachment has been made to fit the Greenlee No. 770 Power Unit, and can be purchased as a separate attachment or as a complete bender with power unit and attachment together.

### FOR $\frac{3}{8}$ " TO $1\frac{1}{4}$ " COPPER TUBING

Greenlee Copper Tube Benders were designed for bending the copper and aluminum tubing used in the plumbing, refrigeration, aviation, and air-conditioning fields. The No. 760 Bender will bend  $\frac{3}{8}$ ,  $\frac{1}{2}$ ,  $\frac{3}{4}$ , and  $\frac{1}{2}$ -inch O. D. tubing while the No. 762 Bender will handle  $\frac{3}{8}$ ,  $\frac{1}{2}$ , 1, and  $1\frac{1}{4}$ -inch O. D. tubing. Ample leverage is provided for fast, easy bending, and a roller holds the follow bar tight to prevent kinking and distortion of the tube.

### SIX SIZES OF BENDERS FOR $\frac{1}{4}$ " TO $\frac{3}{4}$ " TUBING

Here's the handy Greenlee No. 763 Steel Tube Bender for bending steel, copper, brass, and aluminum tubing without kinking and flattening of the tube. Six sizes of benders are available for  $\frac{1}{4}$ ,  $\frac{3}{8}$ ,  $\frac{1}{2}$ ,  $\frac{3}{4}$ , 1, and  $\frac{3}{4}$ -inch O. D. tubing. The tube is held tight to prevent slipping, and the bending is done by rolling action, rather than sliding, which minimizes friction, giving a smooth, even bend without marring the finish of the tube.

SEND FOR  
FREE COPY OF  
GREENLEE  
BENDER  
BOOKLET  
S-116

**Greenlee**  
TOOL CO.

1741 COLUMBIA AVE., ROCKFORD, ILL.

## Boosters Increase Fluorescent Efficiency [FROM PAGE 27]

connected fluorescent lighting load. Most of the installations to date have required units ranging from 0.25 kva. to 1 kva. in size.

### Booster Connections

Because of availability, the boosters generally used in this area have been the General Electric Type M transformer. Consequently, the attendant connection diagrams carry the terminal markings of these units. Other boosters, connected as auto-transformers can be used just as effectively. Installations have been made with one transformer on 110/220 V., single phase, 3-wire (Diagram 1); with two transformers on the same type of system (Diagram 2); with three transformers on 110 V., 3-phase, 3-wire (Diagram 3); with three units on 115/199 V., 3-phase, 4-wire systems (Diagram 4). The latest request for a booster installation has come from a war plant where the 3-phase, 4-wire connection will be used.

One important point to be kept clearly in mind when making booster connections, is to check the polarities of the coils to make sure they are additive and do not buck—but actually boost the circuit voltage. The quickest way of doing this is to take a voltmeter reading on the booster secondary after the primary has been connected to the supply. If the meter reads less than the supply, the booster is bucking and the secondary connections must be reversed. Diagram 5 illustrates one method of checking this on the small bell ringing transformers used on individual fluorescent units. Once the boosters have been added to the circuit, the system is ready for trouble free operation.

### Results Obtained

Booster transformers have been added to several hundred fluorescent lighting systems in Kansas City during the past two years. In each case the results have been so satisfactory that the owners spread the good news to their business associates, and commended both the contractor and the utility on the scheme. Costs are comparatively low, ranging from \$18 to \$24 depending on the size of the unit installed. In most cases it is simply a question of adding the booster to the lighting entrance service or the panel. There is no muss or fuss.

From the standpoint of the customer,

the advantages gained more than offset the installation cost. These include:

1. Elimination of flicker and hard starting on their fluorescent units.
2. Increase in the life of the lamps, since flicker and hard starting materially reduce the rated life of the lamps.
3. A consequent reduction in the number of lamp and starter replacements.
4. An increase in the lighting output of the lamps. With the old style low power factor auxiliaries and the HPF single lamp type, a 10 percent boost in voltage gives a 20 percent increase in light output. For the HPF two lamp auxiliaries, the increased light output is about one percent for each one volt boost in voltage.
5. Increased operating efficiency on cold temperature installations.

From the contractor and utility angle it eliminated the numerous call-backs previously experienced to shoot trouble on fluorescent systems; increased customer confidence in the recommendations of the lighting engineer and the contractor; erased the black eye that fluorescent lighting was acquiring due to faulty and inefficient operation.

This scheme is not the result of pure theorizing. It has withstood the test of two years of operation in various types of installations. It is a method that might well be considered to give trouble free fluorescent lighting in our war plants, especially those that have been and are being converted to war production and in cases where existing electrical systems are being utilized to save critical materials and speed conversion work. It is a scheme the lighting engineer and contractor cannot afford to pass over lightly.

## Industrials Prefer Fluorescent

[FROM PAGE 28]

what we meant by change—"For example, additional fluorescent lighting or an initial fluorescent installation, if you are not using it now."

The answers to this question really provided a further check on the degree of satisfaction expressed in the previous question. For we felt that if a manufacturer expressed himself as entirely satisfied in the previous question, he normally would answer "No" to this question. The correlation is almost per-

fect with 100 percent fluorescent users—92 percent in the previous question, 90 percent in this, but some variation is shown by the answers of 100 percent incandescent users. In other words, only 64 percent of them expressed themselves as entirely satisfied in the previous question—yet 75 percent of them said they were not considering a change in answering this question. The variation of nine percent here helped bring out our point that these answers reflect the fact that 100 percent incandescent users do not know what fluorescent can do for them. For it seems probable that the nine percent who were not satisfied and do not intend to change, don't know just what to do.

It should also be noted that of the 17 one hundred percent fluorescent users who are considering a change, 16 reported that they plan to put in additional fluorescent equipment either because they are expanding their plants, or because they need more light in the space they are using.

### How About Brands?

Another point brought out was that the number of manufacturers having more than one brand of fluorescent fixture, is far greater than those who have concentrated on one brand and used this one brand only. What this shows, apparently, is that most manufacturers are still experimenting with several types and makes of fluorescent fixtures in an endeavor to find the one best suited for them. The figures in this survey show that for every one manufacturer who has standardized his equipment and is using only one brand of fixture, there are three manufacturers who use more than one brand of fixture.

Furthermore, of those who mentioned specific brand, 84 percent listed nationally-advertised brands of fluorescent fixtures—proving, we believe, that this is a field in which nationally-advertised products are preferred to unknown products.

We believe that information of this type is extremely important, not only to us, but to other fluorescent manufacturers, to the public utility companies, to electrical contractors and all who are concerned with the present and future of lighting. We are convinced that a study of the figures in this survey and the results shown by them will help us to better understand the problems of users. And by a better understanding of these problems, we will inevitably be able both to serve present users more efficiently, and to show prospective users how fluorescent lighting can give them more satisfactory light for all purposes.





## Match the insulation to the job

From the Equator to the Arctic, Uncle Sam matches the uniform to the job.

Matching the right insulation to the job is equally important. For instance, the best moisture-resisting insulations are not the most suitable for very high temperature service. And, there are many other factors to consider—resistance to oil, acid, alkalis and corrosive vapors, as well as dielectric strength, flexibility and mechanical strength . . .

For the correct answer to your particular insulation problem, specify "Westinghouse." With that one key word, you gain access to a wealth

of exact application data plus the experience of years in the research, manufacture, repair, and maintenance of every type of electrical equipment.

Westinghouse offers the most complete line of Insulating Materials in the world, from varnishes and cements to micas, fabrics, and tapes. These materials are carried in stock by your near-by Westinghouse Agent.

To help you with your insulation problems, there is an experienced Westinghouse Insulating Material Specialist assigned to your district. Use him! Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., Dept. 7-N.

J-06321



# Westinghouse

**INSULATING MATERIALS**

# Modern Lighting

## LIGHTING A FACTORY OFFICE

With the office personnel of industrial manufacturing plants working on continuous shifts during this war emergency, good lighting is important to effective and accurate work.

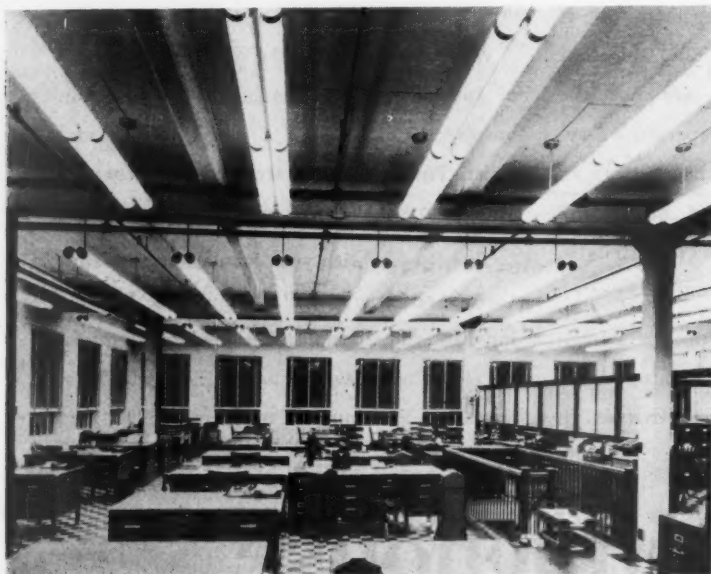
To increase the illumination level in a factory office covering 3,112 square feet and with a ceiling height of 13 feet, a semi-indirect incandescent system was converted to a semi-direct fluorescent system and the foot-candle intensities tripled with but a slight increase in connected load.

Originally the office was lighted by 300-watt semi-indirect, totally-enclosed, prismatic glass units, two units per bay. The total connected load with this system was 10.8 kw., which provided an average of 14 foot-candles.

With the fluorescent system, Wire-mold glass-enclosed fluorescent units were mounted in parallel rows of four

lamps each and suspended approximately 18 inches below the ceiling. The parallel rows of lamps were mounted on four-foot centers and 16-40-watt, 3500° K white lamps were installed in each bay. A total of 272 lamps were used, which resulted in an average of 55 foot-candles in service. The total fluorescent lamp load is 13.6 kw.

The switching arrangement of the incandescent units was staggered and there were only two outlets per bay. In considering the fluorescent lighting system, it was found advisable to change the stagger system to a group arrangement and provide four outlets per bay. To do this the electrical contractor used Wiremold surface raceway and fittings, extending to new outlets at the locations required by the new fixtures. In order to obtain the group switching arrangement, the continuous runs of channel served as a raceway to carry the conductors required for the re-wamped switching.



**FLUORESCENT LIGHTING**—In this factory office a total of 272 glass enclosed fluorescent units provided an average of 55 foot-candles in service.

## LIGHTING IN A MACHINE TOOL PLANT

In the manufacture of machine tools requiring extraordinary precision and accuracy, the skilled machinist is the most important part of the production process. Although the majority of work in a machine shop cannot be classed as hard, manual labor demanding the expenditure of a large amount of muscular energy, the trying requirements of precision and accuracy in machine tool work take just as great a toll of nervous energy from the workers. Lighting conditions can greatly influence tiring workmen who must use their eyes to carry on their activities. It is a well understood fact that tired workmen are more susceptible to foolish accidents and have a less happy attitude



**STAGGERED** 400-watt mercury and 750-watt incandescent give a maintained level of 60 f.c. for precision work.

toward their work than those who are not tired.

This Kenton, Ohio machine tool company has provided the kind of lighting that helps the men to help themselves. The system consists of 750-watt incandescent lamps and 400-watt mercury lamps in high bay equipment, mounted 36 feet high and spaced 10 feet apart on an alternate staggered arrangement. There were 85 foot-candles initial and 60 maintained.

## PRODUCTION'S NO. 1 ENEMY

Reflected glare is generally more objectionable than direct glare and quite frequently more harmful because it is generally from a direction below the horizontal, a zone in which the eye has no natural protection. It may be caused by equipment that does not diffuse the light sufficiently, or from improper location of supplementary lighting units. A change from concentrating light sources to a large-area source is the first and best cure. Adequate coverage to assure diffusion plus

# We're Rolling Our Own!

EFFICIENT LIGHTING DEPENDS ON CONTROLLED QUALITY—  
EVERY STEP OF GUTH CONSTRUCTION IS UNDER GUTH SUPERVISION



Uncle Sam clamped the lid on when he said, "No more metal for Fluorescent Reflectors!"



We decided to use Genuine MASONITE "Reflector-Board", the best fibre-board made for reflector purposes.



But equipment for cutting, smoothing, bending and forming the board was absolutely unavailable.

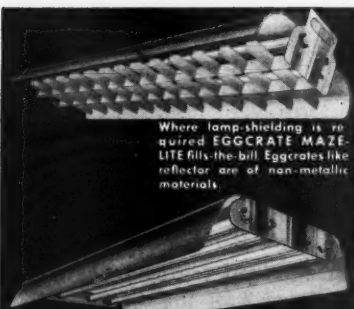


Then we discovered some machine tools that formerly were used in rolling bronze panels.



With a little ingenuity, we built our own machines from these almost worthless scraps—and we made them work!

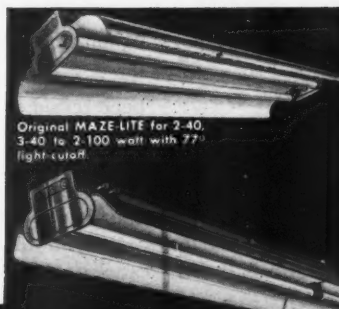
TODAY, we are in production making our own high quality non-metallic Fluorescent Reflectors. Every one of them is a tribute to the adaptability of American industry to meet emergency conditions!



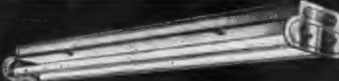
Where lamp-shielding is required EGGRATE MAZE-LITE fills the bill. Eggcrate-like reflector are of non-metallic materials.

SUPER MAZE-LITE for 4-40 and 4-100 watt lamps. Powerful lighting units for high intensities and high-bays.

The GUTH LINE manufactured by the Edwin F. Guth Company, St. Louis, Mo., features the use of genuine MASONITE "REFLECTOR-BOARD" reflectors in compliance with W.P.B.'s order L-78 dated October 19, 1942. The cartoons above describe a minor, but important American drama—important in that the Guth Line can be offered as a varied line—with different shaped reflectors, to perform the many tough Industrial lighting jobs that help increase War Production.



Original MAZE-LITE for 2-40, 3-40 to 2-100 watt with 77° light-cutoff.



INDUSTRIAL LIGHTING STRIPS with Masonite Reflectors. Uses in hundreds of industrial applications.

FLUORECTOR units for 1 and 2 rows of lamps. For inspection lighting and over benches.

★ ★ ★ ★ ★ ★ ★ ★  
*Leaders in Lighting Since 1902*

**Guth**

THE EDWIN F. GUTH CO. • 2615 Washington Ave. • St. Louis, Mo.

Electrical Contracting, January 1943

75



A LIGHTING FIXTURE HAS A BIG

# Here are The

to questions that contractors, wholesalers,  
chief electricians, maintenance and purchasing departments  
about Fluorescent Lighting Fixtures



## 1. How can I be sure of getting fixtures that will give satisfactory lighting performance?

By specifying fixtures that have been tested and certified for electrical, mechanical and lighting efficiency by independent experts. Certified FLEUR-O-LIER fixtures meet 50 definite standards set up by MAZDA lamp manufacturers to assure dependable performance. They are tested and *Certified* to those standards by Electrical Testing Laboratories, Inc., of New York.



## 2. Who makes these tested and certified fixtures?

Certified FLEUR-O-LIERS are made by over 40 leading fixture manufacturers. Any fixture manufacturer who complies with the FLEUR-O-LIER requirements may participate in the program.



## 3. What are some of the points checked by this testing?

Some of the most important speci-

fications checked by Electrical Testing Laboratories are: High power factor, flicker correction, certified ballasts and starters, brightness control, safety, maximum light output, correct heat dissipation and many others.



## 4. Don't other makes of fixtures have these features?

Perhaps. But you can be sure of them *all* in Certified FLEUR-O-LIERS. And because they are Certified by E.T.L., any further test or check by the user is unnecessary.



## 5. Do FLEUR-O-LIER fixtures have non-metallic reflectors?

Many FLEUR-O-LIER Manufacturers are now making Certified fixtures using non-metallic reflectors, which conform to WPB order L-78 (Amended) and to U.S. Bureau of Standards Specifications. FLEUR-O-LIER specifications also cover these units.

RESPONSIBILITY IN A WAR PLANT

# Answers...

engineers,  
are asking



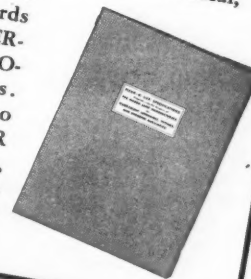
## 6. How can I tell FLEUR-O-LIERS from other fixtures?

FLEUR-O-LIERS are easily recognizable by the Certification label shown on every fixture. Make sure this label is on the fixtures you specify to assure dependable lighting performance and satisfactory operation.

## 7. Are FLEUR-O-LIERS now available—and on what basis?

Certified FLEUR-O-LIERS are now available on suitable priority to plants engaged in war work. For a complete list of manufacturers, write FLEUR-O-LIER Manufacturers, 2122-1 Keith Building, Cleveland, Ohio.

**NEW!** Booklet giving complete FLEUR-O-LIER manufacturing specifications. All technical information for architects, contractors, wholesalers, engineers and purchasing departments on electrical, mechanical and lighting standards as set up for CERTIFIED FLEUR-O-LIER fixtures. Write NOW to FLEUR-O-LIER Manufacturers, 2122-1 Keith Building, Cleveland, O.



# FLEUR-O-LIERS

CERTIFIED FIXTURES FOR FLUORESCENT LIGHTING

Participation in the FLEUR-O-LIER MANUFACTURERS' program is open to any manufacturer who complies with FLEUR-O-LIER requirements.



✓ Use ANY kind of conduit—heavy or Thin-Wall—at ANY outlet.

✓ Make either a Threadless or Threaded connection—at ANY outlet.

✓ Take out the box any time, without disturbing conduit.

✓ Install the conduit, if necessary, before the fittings are delivered.

✓ Widest variety of threadless conduit fittings.

Also . . . Self-Aligning, quickest to install . . . Self-Locking, permanently tight . . . 100% reusable, malleable iron, practically unbreakable.

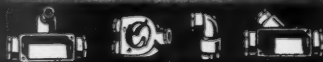
Write for the Kondu Catalog.

**KONDU CORPORATION**  
Erie, Pa.

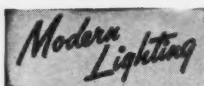
Now in our  
new plant,  
1040 West  
12th St.



**KONDU**



The Threadless Fitting Line  
of Unequalled Variety



[FROM PAGE 74]



**OBJECTIONABLE** glare is eliminated here by tilting the working surface.

proper placement of offending supplementary units can help. As shown in the illustration merely changing the angle of the work may eliminate the objectionable glare.

## ABC'S OF LAMP LIFE

Lamps have a normal life expectancy the same as people do. It is quite common, however, in a new lighting installation for a number of lamps to burn out about the same time. In many cases the customer calls the electrical contractor who installed the lamps and complains of short life. The lamps have probably given their normal life and one of the simplest ways of demonstrating this to a customer is to use this simple formula:

Let A equal the number of lamps in the installation.

Let B equal the number of hours per day operated.

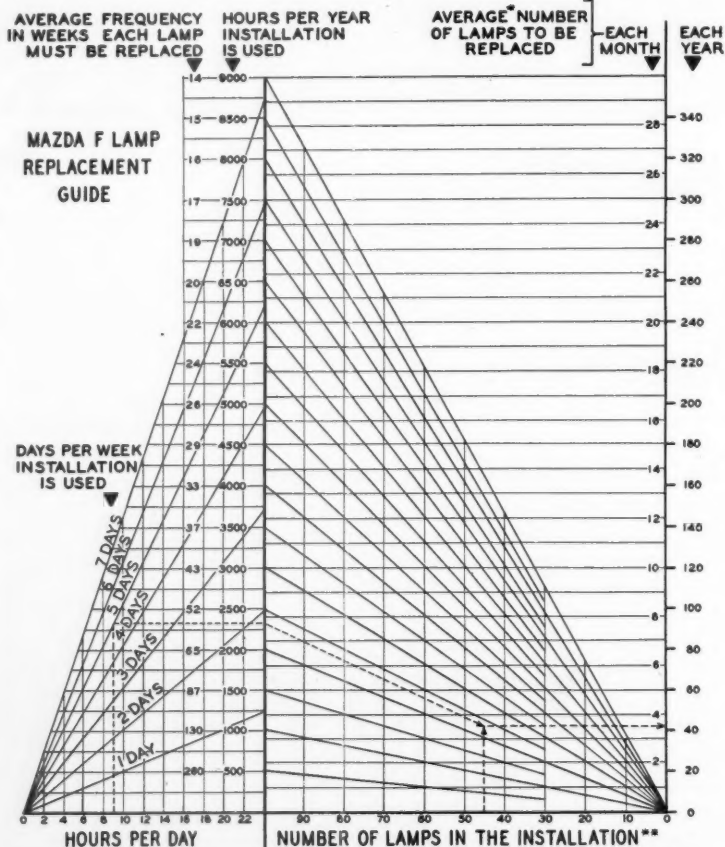
Let C equal the number of days the installation is operated monthly.

Let D equal the rated life of the lamps used.

As an example, let's assume a factory lighted with 300-40-watt mazda F lamps. The factory is operating on three shifts a day; lamps burning 14 hours per day, 30 days per month.

This then is the formula:

$$\frac{A \times B \times C}{D} = \text{Average number of replacements per month}$$



\* Uniformity of lamp quality and performance may cause considerably greater numbers of lamps to fail within any one month or even any one year. Over several months or years, however, the indicated replacement rates may be expected if lamps are operated properly.

\*\* For 1,000-10,000 lamps, the average replacement rates will be ten times greater; for 0-10 lamps will be one-tenth the rates shown.



# OUR WAR TASK IS TO HELP WAR PLANT PERSONNEL KEEP ON TOP OF THEIR JOBS!



## ★ By Providing the Lighting Units that Make SEEING Easier, We are Helping to Safeguard Employees' Health, Efficiency and Safety

### BENJAMIN PRODUCTS

★  
INDUSTRIAL  
LIGHTING EQUIPMENT  
*including fluorescent, incandescent  
and mercury lamp units*

EXPLOSION-PROOF UNITS  
DUST-TIGHT UNITS  
VAPOR-TIGHT UNITS  
FLOODLIGHTING  
EQUIPMENT

★  
MARINE LIGHTING  
EQUIPMENT  
MARINE WIRING DEVICES

★  
SOCKETS AND  
OTHER WIRING DEVICES

★  
SIGNAL EQUIPMENT  
*including Sirens, Horns, Buzzers  
and Telecode Relays*

★  
If you have a problem relating to the use of any of the above products, write the Benjamin Electric Mfg. Co., Product Information Department, (Division H), Des Plaines, Ill., for data and recommendations. Benjamin services in the solution of such problems are available without cost or obligation of any kind.

It is the duty of everyone in war production and essential industrial and military tasks to keep in best possible condition; to be physically strong and mentally alert.

### HOW "RIGHT KIND OF LIGHTING" HELPS US TO KEEP IN PEAK CONDITION

The personal experience of men and women employed in war tasks shows that the right kind of lighting is an important factor in keeping them on top of their jobs. By making it easier to see, the right kind of lighting minimizes eyestrain and thus reduces fatigue.

War production experience has shown that protection against eyestrain fatigue:

- makes the job less tiring
- increases alertness against accidents
- conserves reserve energy needed for sustained effort and provides additional protection against the ill effects of fatigue.

Today all of these things are vitally important. The ever increasing demand upon all of

us for "most production with the least amount of defects and spoilage" is a goal that we cannot fully achieve unless we are physically fit.

Laboratory experiments and actual plant experience show that the basis of the right kind of lighting must be enough light, which in most war production plants should be somewhere between 30 and 50 foot candles—even more for certain types of precision work.

### WHAT IS THE "RIGHT KIND OF LIGHTING"?

However, there is much more to the right kind of lighting than sufficient light for the specific seeing task. Ease of seeing depends also upon the quality of the lighting, its proper direction, diffusion, uniform distribution, and brightness.

It depends upon the elimination of glare from exposed and improperly shielded lamps in the lighting units; the elimination of reflections from shiny surfaces; the elimination of deep shadows and spotty lighting; and choice of proper lighting units for the seeing task and physical requirements of the location and operation.

To provide the lighting units and engineering counsel which will insure the right kind of lighting to war production plants, the army, navy and merchant marine, is Benjamin's major war task... a task in which every man and woman in the Benjamin organization in the plant and in the field, is proud to have a part.

BENJAMIN ELECTRIC MFG. COMPANY, DES PLAINES, ILLINOIS

# BENJAMIN

TRADE MARK



## A TRUSTED FRIEND TURNS ENEMY!

**Y**ES, light can be man's best friend. But when improperly used, it becomes an insidious enemy which saps his vitality by causing eyestrain and fatigue.

War production, with its demand for greater speed and efficiency, has definitely proved the importance of proper illumination. Not only in adequate light, but in carefully controlling it to eliminate glare, sharp

contrasts, shadows and other disturbing factors which work *against* the eyes rather than *for* them.

Better illumination can help you increase much-needed production. Why not ask Goodrich industrial lighting engineers to assist you? The hundreds of styles and sizes of Goodrich fixtures answer every industrial requirement. Write for literature.



Highbrite



Stocklite



Diffuse Floodlight



Seprable RLM Dome



Protecting vital plants with floodlighting — saving man-hours in production — Goodrich industrial fixtures are serving America's war effort everywhere.



GENERAL OFFICES AND FACTORY: 4602 BELLE PLAINE AVENUE, CHICAGO, ILL.  
SOLD ONLY THROUGH ELECTRICAL WHOLESALERS

*Modern  
Lighting*

[FROM PAGE 78]

or

$$\frac{300 \times 14 \times 30}{2500} = 50 \text{ lamps per month}$$

Generally a simple ABC presentation like this turns criticism into praise, for usually the lamps are living much longer than the customer had realized.

### PROTECTIVE LIGHTING

Projector lamps are finding increasing application in the protective lighting field where the throw isn't too great. Here a group of the lamps protect three vulnerable areas. Sabotage of the electrical power supply would cripple the operation of the plant and perhaps black



**PROJECTOR LAMPS** give protective lighting at three vital points eliminating the dark shadows which are the natural allies of the intruder.

out the protective lighting at other vital points. Storage tanks for gas or other inflammable materials are natural allies of the intruder and consequently require lighting. Finally light is provided at the loading dock in order that goods may be transferred safely and that the area be protected against forced entry.

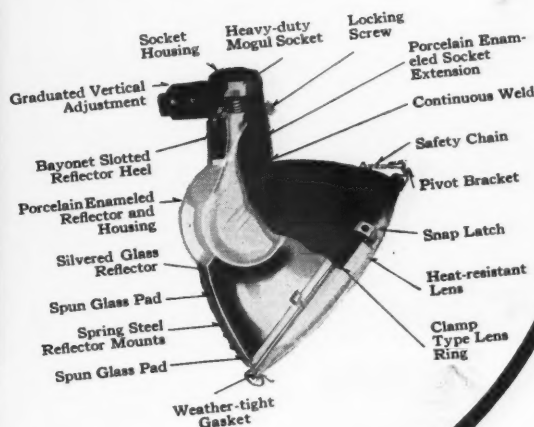
### A STRAIGHT MERCURY INSTALLATION

The familiar 400-watt H-1 Mazda H (mercury) lamp which has been available for eight years is receiving much factory lighting consideration today. This is because of its high efficiency and excellent lumen maintenance characteristics. In addition, the H-1 lamp has a rated average life of 3000 hours. Only one other general lighting source has a similar life-rating—the 100-watt fluorescent lamp.

*Electrical Contracting, January 1943*

# Floodlights

## DESIGNED TO Protect



## NOW A COMPLETE LINE OF FLOODLIGHTS FOR EVERY WARTIME NEED

Our engineers have given eyes to the "night watch" with a new line of protective floodlights that help guard American war industries.

Westinghouse Types EH and EHG with universal lamp position, and VEG with vertical lamp position, are rugged, weather-tight units. And to meet a variety of lighting needs, a choice of narrow beam reflector (silvered glass) or wide beam reflector (porcelain enameled steel) with various lens and lamp combinations, is available. Both types of floodlights have graduated, locking adjustments to facilitate aiming and relamping.

For stand-by emergency lighting, Westinghouse Type E floodlights, with universal lamp position, are available in sizes from 75-watt to 1000-watt for wide beam application only.

Producing this line of protective floodlights for America's "night watch" is an all-out job at Westinghouse today. And the nearest Westinghouse Lighting Distributor will gladly help answer any protective lighting problem you may have. Or, you may write for "Protection with Light" Planning Book, B-2280-A. Westinghouse Electric & Manufacturing Company, Edgewater Park, Cleveland, Ohio.



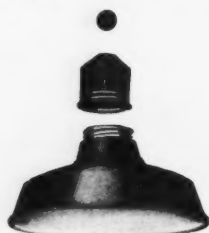
# Westinghouse

**LIGHTING EQUIPMENT**





★ When you sell QUAD Lighting Units you sell products scientifically designed to give your customers the highest lighting efficiency. Full line of industrial and floodlighting equipment—incandescent — fluorescent — mercury vapor. It's the line that stays popular.



NO. 1184-M  
RLM THREADED  
DOME REFLECTOR

**QUADRANGLE MFG. COMPANY**  
*Mfgs. of Incandescent and Fluorescent Lighting Equipment*  
31 SO. PEARIA ST. CHICAGO, ILL.



**HIGH-BAY MERCURY** high-intensity lamps of 400 watts each with 3000 hours rated life are mounted on 10-foot centers to provide 60 foot-candle illumination for machine tool work requiring high-degree accuracy.

This installation in a large Ohio tool works consists of 400-watt mercury sources in high-bay reflectors, one unit for each 100 square feet. The average illumination in service is on the order of 60 foot-candles.

## Lighting AN AIRPLANE FACTORY *Fluorescent*

**PROBLEM:** (1) To provide high visibility for all machining, sheet metal forming and sub-assemblies essential to the manufacture of airplane parts.

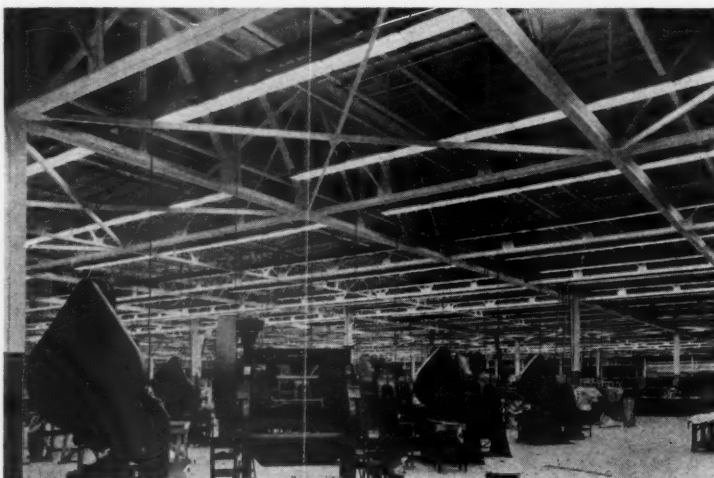
**CONSTRUCTION DATA:** (1) The area is 1000 by 600 feet with a monitor ceiling. Walls and ceiling are finished in flat white, and the floor is natural concrete.

**SOLUTION OF PROBLEM:** (1) General illumination is provided by continuous rows of 4-foot RLM fluorescent open porcelain-enamel steel reflectors . . . each designed for three 40-watt, 48-inch white mazda F lamps. These were equipped originally with two

lamps per reflector, thus permitting a 50 percent increase in illumination at relatively low cost, whenever desirable. The rows are spaced on 13-ft. 6-in. centers, mounted 22 feet above the floor. There are some 9000 reflectors in the low-bay area.

The wiring and high power factor auxiliaries are carried in a continuous wiring channel from which the individual reflectors are detachable for maintenance purposes. Each unit is equipped with a Tulamp ballast which has essentially unity power factor and which minimizes stroboscopic effect.

**RESULTS:** The average illumination in service is 30 foot-candles at the working level.



**CONTINUOUS ROW** lighting designed for 3 lamps but equipped at present with only 2 per fixture, which gives 30 foot-candles at working level.



● You'll subscribe to that, we know:  
*Nothing but the best will do for the American Soldier.*

But are you carrying the thought out to its logical conclusion?

In your territory are plants doing vitally important war work. It is just possible – what with the concentration on attaining peak production and top quality – that some of them are doing it the hard way.

A survey by you would find the plants handicapped by inadequate lighting. You can show them how industrial accidents lurk in shadows, how glare multiplies rejects.

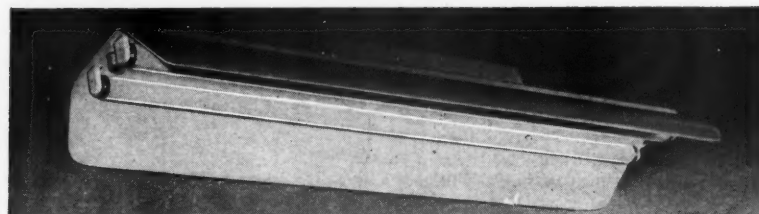
Tell them about cool, shadowless, glareless fluorescent – nothing but the best for industrial lighting.

It may be that plants, faced with actual or impending copper and power shortages, need to know that existing circuits

can usually be switched to fluorescent without additional wiring, that fluorescent gives more than twice as much light for the same wattage.

By introducing fluorescent to plants with lighting handicaps, you serve your country. And you can make a permanent customer by specifying Sylvania Fluorescent Lamps – not only for new installations but for replacements in existing fluorescent systems.

Sylvania fluorescent specialization has resulted in lamps without superior on point of color, life, lumen output, freedom from end-bands and low cost.



**PRIORITY NOTE:** New fluorescent lighting equipment can be secured when it can be shown to be helpful to war production. Better lighting, scientifically applied, almost invariably improves production. Therefore, it is relatively easy to replace old lighting systems with fluorescent. If you wish, our representative will gladly assist you in securing the necessary priority rating. Write Department EC-1.

# SYLVANIA

**ELECTRIC PRODUCTS INC.**

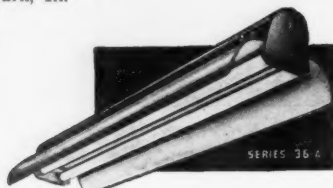
formerly Hygrade Sylvania Corporation  
Salem, Mass.

*Incandescent Lamps, Fluorescent Lamps, Fixtures and Accessories, Radio Tubes, Electronic Devices.*

# EQUIPMENT *News*

## Fluorescent Unit

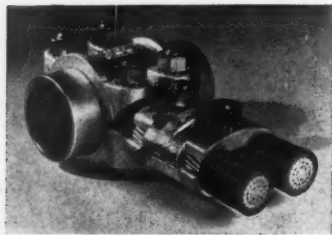
New "all non-metallic" fluorescent units for industrial use. Individual units for two and three 40 watt and two 100 watt lamps. Available for chain hangers, pipe hangers or surface mounting. Reflectors and housings are of special pressed hard board, formed under controlled conditioning. Ballasts, sockets and lamp starters are mounted in housing. Reflector fastens to housing by two wing nuts. Fixtures are furnished wired complete with E.T.L. approved ballasts. Lighting Products, Inc., Highland Park, Ill.



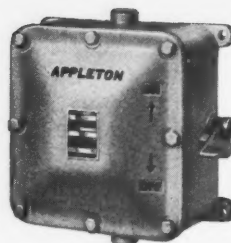
LIGHTING PRODUCTS FLUORESCENT UNIT

## Power Connector

This new power connector, known as Type "KTC," is a compact, flexible, fitting made with two or three wire branch taps, taking a wide range of wire sizes. The O.Z. interlocking clamp binds all strands tightly in the lug. It is claimed that the accurate machining of parts and the high copper alloy, assure full conductivity, corrosion resistance and long service life. Hex-head bolts are held fast by recesses in the body of the connector. O.Z. Electrical Manufacturing Co., 262 Bond Street, Brooklyn, N. Y.



O. Z. POWER CONNECTOR



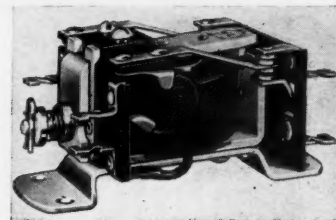
APPLETON SWITCH

## Switch

Type "FLS" explosion-proof and dust-tight switch has been redesigned. It has a quick make and a quick break non-fusible safety switch for general use and motor circuits. It is primarily a safety unit built in a heavy malleable housing, manually operated and made in accordance with the Underwriters' requirements. It does not require the interlocking features on the cover and switch handle. These Unilets are listed with one hub in each end, both hubs for threaded conduit of the same size. Available in 30 and 60 amp., two and three poles, 250 and 600 volts. Appleton Electric Company, 1701 Wellington Avenue, Chicago, Ill.

## Insulating Material

Varnished rayon, varnished cotton cloth and varnished Nylon have been developed for electrical insulation formerly provided by varnished silk. It is claimed that all these materials possess good dielectric strength with tensile and tear strengths equal to or better than varnished silk and can be punched into special shapes. They are available in thicknesses from .003-in. to .008-in. in straight-cut rolls or bias cut strips in 51-in. lengths. Each base material is coated with special insulating varnish. Varnished rayon has a dielectric strength of 1200 VPM and is used for wrapping leads, small magnetos and coils; varnished cotton dielectric strength is 1200 VPM. Irvington Varnish & Insulator Company, 10 Argyle Terrace, Irvington, N. J.



WARD LEONARD RELAY

## Relays

Bulletin 104 relays are small compact remote control units adapted to applications within their ratings where space is limited. They are available for operation on a.c. and d.c. circuits. Standard relays are the open type, front connected solder type terminals, double pole, double throw, silver-to-silver contacts. Contacts are rated 4 amperes up to 24 volts a.c. or d.c. and 4 amperes a.c.; 1 ampere d.c. from 25 to 115 volts. Relays are vibration resistant up to ten times gravity in energized position. Overall height from base to armature is 1 1/4 inches. Ward Leonard Electric Co., Mount Vernon, N. Y.

## Relay

This new dust-tight relay is designed for aircraft applications requiring high current-carrying capacity. It is a solenoid-operated device with the normally open contacts rated at 10 amperes direct current. These contacts will make or break 30 amperes at altitudes up to 40,000 feet. The coil, contacts and plunger are enclosed in a dust-tight housing, and the unit is corrosion-proof. It can be furnished in a single-pole, single-circuit form with normally open contacts or in a single-pole, two-circuit form with one normally-open and one normally-closed contact. The operating coil can be furnished for either 12- or 24-volt d.c. operation. Relay can be mounted in any position on a metal or non-metallic base. The relay is designed for use in an ambient temperature range of from 95 C to minus 40 C, and will withstand 95 per cent humidity at 75 C on 48-hour tests and operate immediately thereafter. General Electric Co., Schenectady, N. Y.

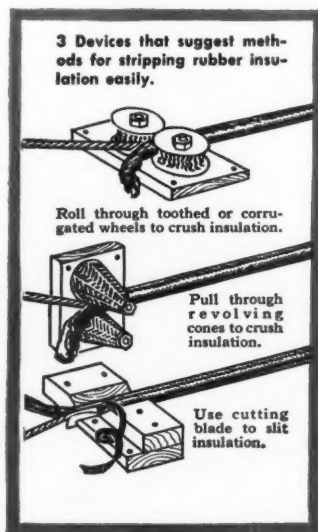


G-E RELAY





## that Rubber Scrap is Priceless!



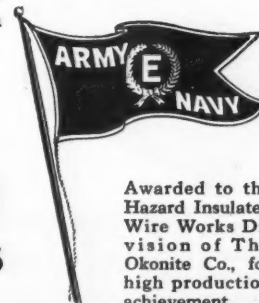
The rubber insulation of wire and cable is even more valuable today than the copper conductor, scarce as copper is! Saving vital copper is absolutely necessary, of course, but the rubber in wire and cable insulation is priceless. The rubber shortage is so acute that immediate corrective measures in both military and civilian life have become necessary. So get into the scrap and salvage both copper and rubber.

Hazard cords, cables and insulations have extra years of service built into them. Get these extra years of service by using every precaution for their protection and longevity. But, if they can no longer be used, *strip* off the rubber insulation and sell it to a licensed rubber dealer and sell the copper conductor to a metal dealer.

The scrap you save here and now may later become the difference between victory and defeat on some far-flung battlefield.

**HAZARD INSULATED WIRE WORKS**  
DIVISION OF THE OKONITE COMPANY  
Wilkes-Barre, Pennsylvania  
Offices in Principal Cities

**HAZARD**  
INSULATED WIRES & CABLES



Awarded to the Hazard Insulated Wire Works Division of The Okonite Co., for high production achievement.

**Only 6 Ounces of  
Steel Per Foot**

**THE  
NEW**

**SPERO DUR-O-LITE**  
**REFLECTOR  
AND RACEWAY OF  
NON-METALLIC MATERIAL**

## WHAT THIS MEANS TO YOU:

Because this fixture takes 90% less critical steel, you can now keep right on selling fluorescent lights to help speed war production. Besides meeting the requirements of the new limitation order L78, which prohibits steel reflectors, this new unit also eliminates steel from the raceway. Reflector and raceway are made of synthetic resin-bonded plywood—the strongest non-metallic structure—used successfully in airplanes, gliders, PT boats, etc. . . . Designed for industrial installations, Spero DUR-O-LITE meets Bureau of Standards specifications for reflectors. Reflecting surface has high-gloss white enamel finish (reflection factor 88%), exterior surfaces are battleship gray. Available for two or three 40 watt tubes.

This unit may also be equipped with the new Spero development "INSTA-LITE", which provides instantaneous illumination, without flicker or delay. INSTA-LITE eliminates the starter and with it 85% of the trouble of average fluorescents—thus greatly reducing maintenance costs. Lighting starts at lower temperatures and lower voltage—there are no false starts to shorten tube life.

Don't pass up profitable War Plant installations. Get the facts about the new DUR-O-LITE today. SPERO offers you the most modern line of industrial fluorescent and incandescent fixtures . . . Distributed only through electrical wholesalers.

**With NEW  
INSTA-LITE**  
gives you *Instant Starting*  
and *Instant Lighting* with  
**NO starting switch**

**SPERO**  
**...5 LINES**  
*of Products from  
one dependable source*



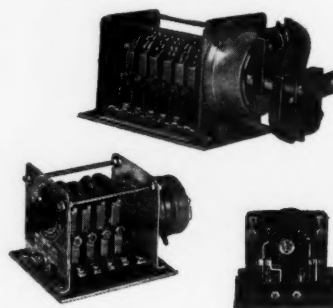
**THE SPERO ELECTRIC CORPORATION**  
18222 LANCKEN AVE. ★ CLEVELAND, OHIO

**EQUIPMENT**  
*News*

[FROM PAGE 84]

## Timers

These multi-contact timers are to automatically control a sequence of "on" and "off" operations of a single or a multiple number of electrical circuits in accordance with a pre-determined operating program. Some of the features are self-starting synchronous motor; complete gear trains operating in oil; bakelite cams mounted on shaft in identical pairs; can be manually operated; contacts in plain view and can be provided with remote momentary starter. They are used to control a series of machine operations in definite order; to automatically reverse or alternate in operation a group of motors, machines or devices; to operate in a predetermined sequence. The R. W. Cramer Company, Inc., Centerbrook, Conn.



CRAMER MULTI-CONTACT TIMERS

## Lighting Fixture

Two new types of fluorescent lighting units feature a non-metal reflector known as "Lumenite." It is claimed that this new material is tough and strong, moisture and high-heat resistant, non-corrosive, non-scaling, with high gloss white enamel finish. Other features,—Tulamp high power factor ballast is exposed through top of fixture to permit cooler operation, longer life; starter switches are mounted on top of unit, so they may be removed without disturbing lamps. Model No. 2045 uses two 40-watt bulbs, and No. 2046 two 100 bulbs. Mitchell Manufacturing Company, 2525 Clybourn Avenue, Chicago, Ill.



MITCHELL LIGHTING FIXTURE

# help *for contractors*

*who must* WORK FAST... SAVE MATERIALS... GET RESULTS

When you must get new war plant wiring systems into service in a hurry . . . or modernize older electrical systems to meet war-time requirements . . . look to Wiremold.

Wiremold "3000" System-Wiring for plant light and power circuits is easy to install . . . quick to install. PLUGMOLD plug-in-anywhere System-Wiring will provide your customers with any number of outlets, right where they want them.

These thoroughly tested wiring systems are fully described in the new 4-page bulletin pictured above. New industrial type receptacles, typical installations, detailed installation instructions are all included. Fill-in and mail the coupon for your copy. The Wiremold Company, Hartford, Conn.

The Wiremold Company  
Elmwood P. O., Hartford, Conn.

Gentlemen: Please send me a copy of your industrial wiring bulletin, "WIREMOLD SYSTEM-WIRING Speeds War Production."

Name .....

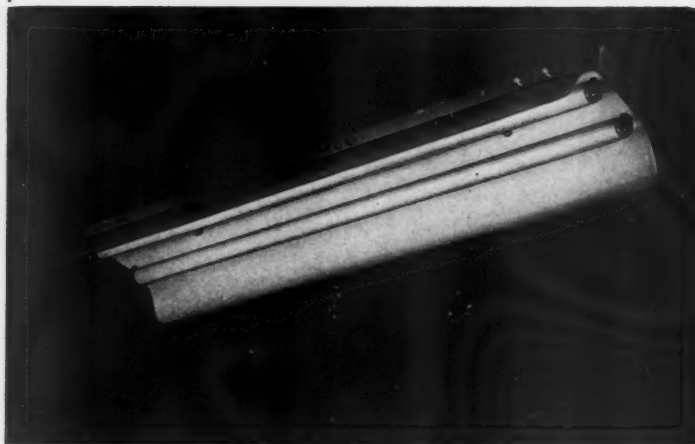
Title .....

Company .....

Address .....



# WAR PRODUCTION LIGHTING . . .



***saves metal—  
gives more light!***

The new OAMCO Non-Metallic Fluorescent Fixtures for Industrial Lighting are made to conform to the simplified designs of the National Bureau of Standards.

The reflectors are made of a rigid non-metallic material and treated with two coats of glossy white, chip-proof enamel that gives them a reflection factor of 85%. Baked at 300° F., they have a tough hard surface that will not discolor and is easy to keep clean.

Furnished in DOUBLE 40, TRIPLE 40 and DOUBLE 100 units, OAMCO Non-Metallic Fluorescents are adaptable to 110-125, 220-250 volt industrial installations and may be mounted by either the Jack-Chain, Direct to Conduit or End to End method. Write to-day for complete information on this new War Production Line!

**RIGHT LIGHT SINCE 1902**

**OVERBACH & AYRES MFG. CO.**

MEMBER OF THE R L M STANDARDS INSTITUTE

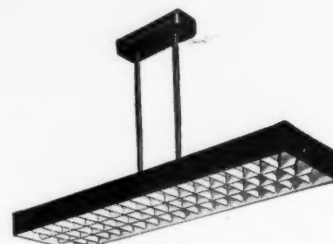
411 SOUTH CLINTON STREET • CHICAGO

**EQUIPMENT** *News*

[FROM PAGE 86]

## Lighting Unit

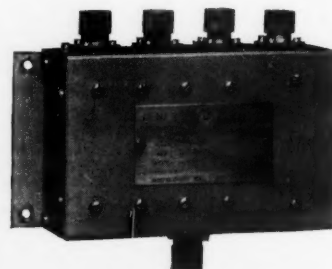
A new wooden fluorescent lighting unit for office and drafting room has been announced. It is known as the "Admiral" and follows the design of the "Ace," which it replaces in this line for the duration. The Admiral is standard in two, three, four and six lamp units and may be secured for continuous runs also. Bass-wood louvers provide adequate shielding and are hinged for easy cleaning and relamping. All wooden pieces are anchored with metal pins at the corners and cemented with glue to withstand changes in humidity. The reflector is a Masonite reflector board and there is a "V" shaped deflector between each pair of lamps. The Wakefield Brass Company, Vermilion, Ohio.



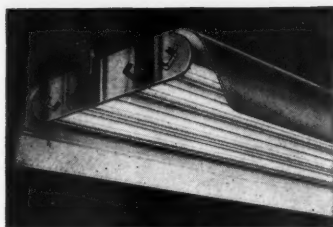
WAKEFIELD LIGHTING UNIT

## Ballast

This new enclosed fluorescent lamp ballast is designed for use in aircraft. It operates four 4-watt Mazda F lamps, designated as T-6 by 28, FA-5 (pinless) blue F-6 lamp, for instrument-panel lighting. It operates from a 26-volt, 400 cycle power supply at all frequencies from 385 to 416 cycles. An input-voltage variation of 23.5 volts to 28.5 volts is permissible. The size of the ballast is approximately 3½ by 6½ by 2 in. Operation is unaffected by a wide range of ambient temperatures up to 140 F. General Electric Co., Schenectady, N. Y.



G-E ENCLOSED BALLAST



GUTH INDUSTRIAL UNIT

### Lighting Unit

This new fluorescent lighting unit has been designed to furnish high intensity lighting for industrial inspection areas and also for illumination of high bay areas. It is a non-metallic reflector, and known as the Super-Maze-Lite. "Bump-proof" ends protect lampholders. Reflector has deep light cutoff and is formed of Masonite reflector board. It is available with the new Forlamp ballast for 265 volts; also for 110-125 and 220-250 volt circuits, and in two sizes, either for four 40 watt or four 100 watt fluorescent lamps. The Edwin F. Guth Company, 2603 Washington Avenue, St. Louis, Mo.

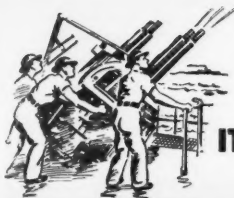


REVERE  
INCANDESCENT  
SEARCHLIGHT

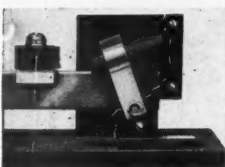
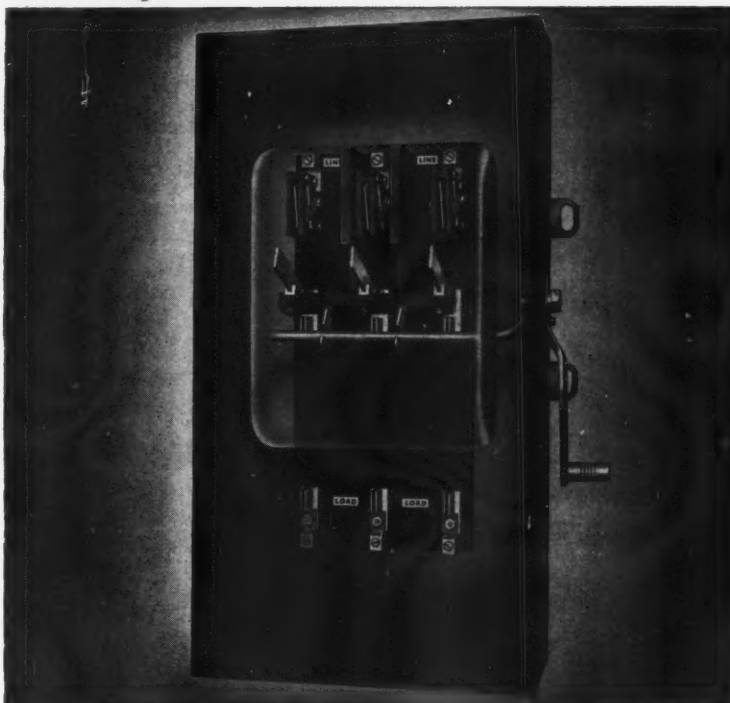
### Incandescent Searchlight

These new dust, bug and weather-tight incandescent searchlights are for varied industrial use. Available with 12 and 18 inch lenses and suitable for protective lighting at ordnance plants, industrial plants, bridges, oil storage yards, public utilities. A number of mounting arrangements available, including pilot house control. Searchlights are designed for continuous operation with 1500 watt lamps in the 18 inch size and up to 600 watts in the 12 inch size. Wattage of 2000 and 1000 can be used in the 18 and 12-inch searchlights respectively if used intermittently. Standard socket equipment is a Mogul pre-focus socket. Mogul screw or bi-post type can be had if desired. When used in pilot house, unit is equipped with friction clutch and rotation stop. Revere Electric Mfg. Company, 2949 N. Paulina St., Chicago, Ill.

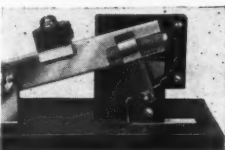
*Electrical Contracting, January 1943*



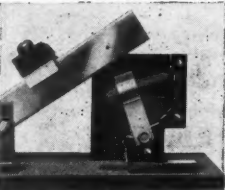
IT'S YOUR PIGEON, TOO, MISTER



*View of Rolarc snuffer showing blade in full engagement with live contacts before passing thru rollers towards OFF position.*



*View of Rolarc snuffer showing blade at point of final disengagement from live contact jaws.*



*View of Rolarc snuffer showing blade after disengagement from live contact and rollers. Rollers snapped together again obstructing path of possible arc.*

## THE FEDERAL *Rolarc* .. DESIGNED TO DO THE JOB

Winning the war is our problem—our job as much as it is the job of the men manning the guns. It's our "Pigeon"—and yours.

To get the job done—to help do it faster and better—Federal developed the 575 Volt Rolarc Safety Switch. Here's a dependable, hard working switch, 100 to and including 600 ampere capacity, built to carry the load.

Engineered on an entirely new principle of arc control, the Rolarc reduces the possibility of arcing to an absolute minimum. It lengthens switch life and conserves war-vital copper . . . it increases the safety factor and saves priceless time and power by eliminating dangerous arcing . . . it increases production by eliminating delays caused by switch failure.

If production is "your pigeon" let the Federal Rolarc Safety Switch help get the job done. *Get all the facts—write for bulletin 42-12.*

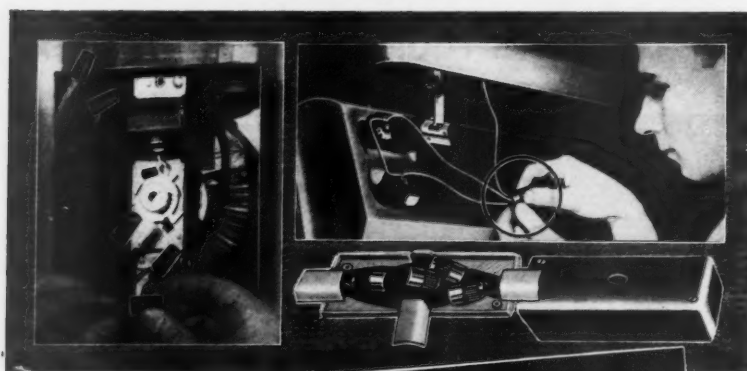
*Until stocks on hand are exhausted we must reserve the right to ship our regular 575 Volt Safety Switch unless Rolarc is specified on the order.*

**FEDERAL ELECTRIC PRODUCTS CO.**  
48 PARIS STREET NEWARK, N. J.

PANELBOARDS • SWITCHBOARDS • SAFETY SWITCHES • CIRCUIT BREAKERS

Unit Heater Installation. "Wire Nuts" speed up new wiring jobs and simplify changes.

(Upper Illustration) "Wire Nuts" Speed Up Fluorescent Fixture Installation and Repairs.  
(Lower Illustration) "Wire-Nuts" occupy very little space. Compact and neat.




**IDEAL**

*Wire-Nuts*  
Solderless, Tapeless, Wire Connectors

**SPEED WIRE JOINTS**

Wiring war plants and homes . . . new machine installations . . . additional lights for night work and exterior protection . . . and other wiring changes must be finished *quickly!* No delays when you use IDEAL "Wire-Nuts".

#### ONE-TWO—and You're THROUGH!

1. Strip Wires 
2. Screw On 

**That's All!**

Simple! A pocketful of "Wire-Nuts" and a Wire Stripper is all you need. Easy! "Wire-Nuts" thread onto the wires just like a nut on a bolt. Quick! Strip wires, Screw on, That's All! NO Solder, NO Friction or Rubber Tape, NO Soldering Iron, NO Fire Danger.

#### SAVE CRITICAL MATERIALS!

IDEAL "Wire-Nuts" do not require Lead, Tin and Rubber as used in solder-and-tape joints. Thus they conserve critical materials. Immediately available—no lost time waiting for slow deliveries. Easy inspection, quick approval. FULLY APPROVED. Listed by Underwriters' Laboratories, Inc. Standard with thousands of Electrical Contractors.

#### BETTER, Electrically; STRONGER, Mechanically!

As you twist "Wire-Nuts" onto skinned wires, coil spring insert automatically compresses and twists the wires together. Clean threads are pressed into wires, making a joint several times stronger than best soldered joint. SIZES FOR EVERY JOB. Millions in use. Write for FREE Samples, Today.

#### Prompt Shipment

#### Other IDEAL War-Time Wiring Job Speeders

- FISH TAPE REELS AND PULLERS
- WIRE STRIPPERS
- JOIST BORERS
- BX ARMOR CUTTER
- CABLE RIPPER
- SWITCH BOX SUPPORTS

**SOLD THROUGH JOBBERS**

**IDEAL COMMUTATOR DRESSER CO.**

1041 PARK AVE., SYCAMORE, ILL. ★ SALES OFFICES IN PRINCIPAL CITIES

**EQUIPMENT** *News*

[FROM PAGE 87]

#### Floodlight

New large models for floodlighting airports, emergency fields, hangars, shipyards, railroad yards and factory grounds have been added to the Circulite floodlight line. They can also be used for night construction or repair work and mounted on floor or on truck. The 1610 series uses 300-500 watt lamps, is adjustable to any angle vertical or horizontal and has a 12-inch chromium plated reflector. Steber Manufacturing Co., 2451 N. Sacramento Ave., Chicago, Ill.



STEBER FLOODLIGHT

#### Limit Switch

This new Type LS Limit switch of the roller arm, spring return type, is for general purpose applications. It is designed primarily for making and breaking control circuits or indicating circuits at a fixed point in the operating cycle. It uses replaceable double-break self-aligning silver-to-silver contacts. The operating arm can be set in any one of 30 positions and is available in two sizes. Standard arm is 2½ inches and short arm is 1½ inches between centers. Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.



WESTINGHOUSE LIMIT SWITCH



## Steaming Out Wire Jams

[FROM PAGE 24]

The unit, now being given its "proving ground" tests by Chicago contractors with U.R.C. cooperation, on various government - approved modernization projects provides the following advantages:

For the contractor:

1. Saves labor, copper, steel and other materials.
2. Provides a means of developing, with the aid of small diameter wire, a vast post-war rewiring market that normally would be stifled because of cost and extensive building alterations.

For the customer:

1. Will enable him to acquire adequate wiring and electrical facilities at a reasonable cost.
2. Eliminates the necessity of marring building interiors by replacing jammed conduits with new and larger electrical circuits, together with the attendant redecorating costs.

Although at present wartime metal restrictions prevent the manufacture of this unit, after the duration it may well become an important cog in eliminating one of electrical modernization's most common "bottlenecks."

## More Gossip

### Wartime Construction

Harry Evans, Evans Electrical Construction Co., Kansas City, Mo., is getting first hand information on saving critical materials on electrical construction. He is a joint-venturer on an aviation engine plant being built in the Kansas City area where the original plans have been revised to permit open-wire feeder installations, wood supports for grillework-side busways and many other metal saving ideas. It's mighty interesting work, he reveals, fishing about for substitutes.

### Contractor Heads Essex League

At a recent meeting of the Essex Electrical League, Newark, N. J., Joseph F. Buhl was elected president of the group. Mr. Buhl is also president of Buhl and Caffrey, Inc., enterprising electrical contracting firm of Newark, N. J.

Other officers elected to the '43 slate include: Ralph Morrison, vice-president; James Stapleton, secretary; and R. J. F. Cullen, treasurer. Members of the Executive Committee include: E. C. Heidt, B. A. Seiple, J. A. Arthur, C. A. Stevens, and W. A. Shaw.

# Latrobe PRODUCTS

★ FLOOR BOXES ★ WIRING SPECIALTIES ★

HIGH  
QUALITY

EASILY  
INSTALLED

## FOR EVERY INDUSTRIAL, COMMERCIAL OR RESIDENTIAL REQUIREMENT

Latrobe products are being used extensively in Government projects and in industrial plants engaged in war production. Less time for installation and assured dependability give them preference also for all commercial and residential jobs, both temporary and permanent.

Every Latrobe product is flexible as to use. Made of the best materials, economical and long lasting.



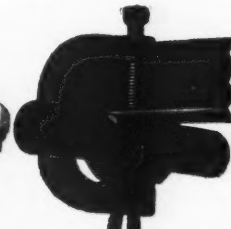
NO. 284 RECEPTACLE  
NOZZLE

One of the many "Latrobe" type nozzles for watertight floor outlets. No. 284 is a duplex nozzle. Very neat and compact.  $\frac{1}{2}$  inch brass pipe extension. Or, if required,  $\frac{3}{4}$  inch pipe extension.



NO. 110 LATROBE  
WATERTIGHT BOX

Here is a cut-away view of the No. 110 Watertight Box showing how the tapered unit receptacle fits tapered opening in top of box body. This box is constructed of fewest number of parts, may be installed quickly, provides ample wire space inside the box and makes a safer job.



PIPE OR CONDUIT  
HANGERS

No. 470 Hanger handles  $\frac{1}{2}$ ",  $\frac{3}{4}$ " and 1" pipe to steel beams  $\frac{3}{8}$ " thick. Turns freely. No drilling or use of straps.



KEYSTONE  
FISH WIRE

Made of the finest grade flat steel wire properly tempered. Ten sizes. Packed 100, 150 and 200 foot coils. Other lengths if required.



"BULL DOG"  
INSULATOR  
SUPPORTS

Malleable iron of high tensile strength for fastening porcelain and glass insulators to exposed steel framework.

FOR BEST RESULTS  
STOCK LATROBE PRODUCTS  
SELL LATROBE PRODUCTS

DURABLE



ECONOMICAL

FULLMAN MANUFACTURING CO.  
LATROBE . . . PENNSYLVANIA

# In the News

## CONDUIT CUT FOR 1943

Under the provisions of Limitation Order L-225, installations of rigid conduit, metallic tubing, flexible tubing and metal raceways for enclosure of wire and cable will be much curtailed in the coming year due to the shortage in supply of ferrous and non-ferrous metals and alloys.

*Definitions for the purposes of this order:*

(1) "Rigid electrical conduit" means rigid steel or iron pipe in sizes  $\frac{1}{4}$ -inch to 6-inches inclusive, commonly known as "heavy wall conduit."

(2) "Electrical metallic tubing" means steel tubing in sizes  $\frac{3}{8}$ -inch to 2-inches inclusive, commonly known as "thin wall conduit."

(3) "Flexible metal conduit or flexible metal tubing" means helically wound flexible steel tubing manufactured in sizes  $\frac{5}{16}$ -inch to 3-inches inclusive.

(4) "Raceways" means any metal enclosure or channel which is designed expressly for the protection and/or the holding of electrical wires and cables, including, but not limited to, surface metal raceways, under floor metal raceways, cellular metal floor raceways, metal wireways, metal wiring troughs, and metal under plaster extension raceways. Raceway shall not include busways, rigid electrical conduit, flexible metal conduit, flexible metal tubing or electrical metallic tubing.

(5) "Used" means having been installed or put in service.

(6) "Distributor" means any person regularly engaged in the business of buying for resale and selling electrical supplies.

(7) "Electrician" means any person not a distributor who is engaged in installing, maintaining or repairing electrical systems.

(8) "Put in process" means the first change by a manufacturer in the form of material from that form in which the material was received by him.

(9) "Implements of war" means products manufactured for use in combat including, but not limited to, warships, aircraft, armament, weapons, vessels, tanks, locomotives and vehicles.

*General restrictions:* rigid electrical conduit (1) On and after the first day of January 1943, no person shall in the manufacture of any rigid electrical conduit during any calendar quarter put in process any metal in excess of one-tenth (1/10) of the total weight of metal put in process

in the manufacture of rigid electrical conduits by him during the calendar year 1941.

(2) On and after the 19th day of December, 1942, no person shall install in any building or other structure, rigid electrical conduit, sizes  $\frac{1}{4}$ -in. to 2-inches inclusive, except in a project: (a) To which a preference rating of A-1-j or better has been assigned; and (b) In which the electrical installation is such that the 1940 edition of the National Electrical Code establishes the use of such rigid electrical conduit as a minimum acceptable standard method of wiring in Class I, II, III, and IV hazardous locations.

(3) On and after the 19th day of December, 1942, no person shall install in any building or other structure rigid electrical conduit sizes  $2\frac{1}{2}$ -inches to 6-inches inclusive, except in locations or projects to which a preference rating of A-1-j or better has been assigned and in which: (a) The electrical installation is such that the wires or cables must for safety purposes be protected from mechanical injury, or (b)

The electrical installation is made in damp or wet locations as defined in the 1940 edition of the National Electrical Code; or (c) The electrical installation is such that the 1940 edition of the National Electrical Code establishes the use of such rigid electrical conduit as a minimum acceptable standard method of wiring in Class I, II, III, and IV hazardous locations.

(4) On and after the 19th day of December, 1942, no distributor shall sell or deliver to any person rigid electrical conduit except pursuant to a preference rating of A-1-j or better.

*General restrictions; electrical metallic tubing.* (1) On and after the 19th day of December, 1942, no person shall install in any building or other structure any electrical metallic tubing, except in a project to which a preference rating of A-1-j or better has been assigned and in which the electrical metallic tubing is: (a) To enclose electric wire or cable exposed to mechanical injury in the wiring to machinery or production equipment; or (b) To enclose electric wire or cable embedded in concrete or masonry walls; or (c) To enclose electric wire or cable located in elevator hoistways, and used for elevator power, control and signal purposes; or (d) To enclose electric wire or cable in damp or wet locations as defined in Article 100 of the 1940 edition of the National Electrical Code.

(2) On and after the 19th day of December, 1942, no distributor shall sell or deliver to any person electrical metallic tubing except pursuant to a preference rating of A-1-j or better.

*General restrictions; flexible metal conduit or flexible metal tubing.*

(1) On and after the 19th day of December, 1942, no person shall install in any



"Certainly is more interesting than small house wiring jobs back home, eh?"



## WESCO aid a "lifesaver" to tire production

*Kept Plant Up To Building Schedule;  
Prevented Shutdown and Product Loss*

An Eastern chemical plant produces a critical substance which is a vital part of the Army's famous combat tires. Started without a priority by Government order, this plant, during its erection, was supplied for a year with all electrical requirements by the local Wesco House. Intricate planning and adroit use of non-priority substitutes were required.

Wesco's "know-how" enabled the chemical plant to tie in with the main power plant and begin partial operation 3 months earlier than expected. The customer wrote—"This tie-in material was a lifesaver and greatly helped us continue our construction work." On another occasion Wesco co-operation avoided a major production shutdown.

When the difficult non-priority period was over the customer wrote—"We have expressed our appreciation by telephone several times but wish to confirm this in writing. We thank you for your splendid cooperation." The Wesco service that merits such a letter is now devoted to winning the war. In days of peace that service will be again at the command of industry and business.

### WESCO SPEEDS PRODUCTION

- \* War plant manufacturing basic ingredient of TNT got needed equipment from Wesco in 2 days. Manufacturers promised delivery in 8 to 15 weeks.
- \* Airfield was saved 81 days' delay on delivery of 68 electrical items. Fastest complete delivery by manufacturers was 12 weeks. Wesco required only 3 days.

### WESCO SERVES BUSINESS

- \* By assembling all parts of an order in one shipment.
- \* By furnishing informative and technical data.
- \* By knowing local and national codes and rulings.

## Westinghouse Electric Supply Co.

150 VARICK STREET . . . NEW YORK, N.Y.

A NATIONAL DISTRIBUTING ORGANIZATION WITH 80 BRANCHES



building or other structure any flexible metal conduit or flexible metal tubing, except in locations or projects: (a) To which a preference rating of A-1-j or better has been assigned; and (b) In which the flexible metal conduit or flexible metal tubing is to be used to provide a flexible enclosure for electric wire or cable when such flexibility is necessary for extensions less than twelve (12) feet in length from rigid electrical conduit, electrical metallic tubing, or raceways to electric motors, current consuming devices, or electric control equipment.

(2) On and after the 19th day of December, 1942, no distributor shall sell or deliver to any electrician or other person any flexible metal conduit or flexible metal tubing except pursuant to a preference rating of A-1-j or better.

**General restrictions; raceways** (1) On and after the first day of January 1943, no person shall, in the manufacture of any raceway, during any calendar quarter, put in process any metal in excess of one-eighth ( $\frac{1}{8}$ ) of the total weight of metal put in process in the manufacture of metal raceways by him during the calendar year 1941.

(2) On and after the 19th day of December, 1942, no distributor shall sell or deliver to any person raceways except pursuant to a preference rating of A-1-j or better.

**Specific exemptions.** (1) The provisions of this order shall not apply to any electrical metallic tubing or any rigid electrical conduit or any flexible metal conduit or flexible metal tubing or any raceway which, on the date of issuance of this order: (a) Is in the possession of an electrician or electrical contractor; or (b) Has been physically delivered to the site of construction into which such conduit or tubing or raceway is to be installed.

(2) The provisions of this order shall not apply to any used rigid electrical conduit or any used electrical metallic tubing or any used flexible metal conduit or flexible metal tubing or any used raceways.

(3) The provisions of this order shall

not apply to any rigid electrical conduit, electrical metallic tubing, flexible metal conduit, or flexible metal tubing or raceways to be physically incorporated into implements of war.

**Records.** All persons affected by this order shall keep and preserve for not less than two years accurate and complete records concerning inventories, production and sales.

**Reports.** Each manufacturer to whom this order applies shall execute and file with the War Production Board such reports and questionnaires as said Board shall from time to time request.

**Routing of correspondence.** Reports to be filed and other communications concerning this order shall be addressed to the War Production Board, Building Materials Division, Washington, D. C., Ref: L-225.

## NISA TO HOLD WAR CONFERENCE

A national war conference on maintenance and repair of electrical equipment is being called by the National Industrial Service Association, Inc. at the Netherland Plaza Hotel, Cincinnati, Ohio, on February 17 and 18, 1943. Everyone interested is invited to attend.

There will be one business session on the morning of the first day. The afternoon will be devoted to priorities and material procurement problems. The second morning will be given over entirely to manpower problems. The fourth and last session on the afternoon of February 18th will be a general session given over to a discussion of the application of the new Motor Limitation Order No. L-221, Certified Repair Plan, Accounting and Tax Service for motor repair shops, and the effect of the war on shop practices.

How the new Controlled Materials Plan affects the motor repair shops and what they have to do to meet its requirements will be explained by a representative of WPB. J. W. Mullally of the Copper Division has been invited to tell the repair industry something of his difficulties in getting copper for them and the type of cooperation that he must have in return.

An official from the Manpower Commission will tell of its requirements, explain Manning Tables and Replacement Sched-



**PRIORITIES ANALYST, Duncan McPheeter, Chicago regional office, WPB, urges the motor repair shops in the Chicago area to get under PRP to assure a steady flow of materials for repairs and service.**

ules, and tell the industry what the Manpower Commission will require of it in the months to come. Because it has been necessary to employ so many unskilled men and women, there is a need for some simple aptitude tests to assist in the selection of these employees and such tests will be presented to the Conference. After the employees are hired, they must still be taught their jobs, so the training-within-industry technique will also be presented. The biggest employment problem is bringing women into the shops. A survey of this subject is being made and the results will be made available for discussion.

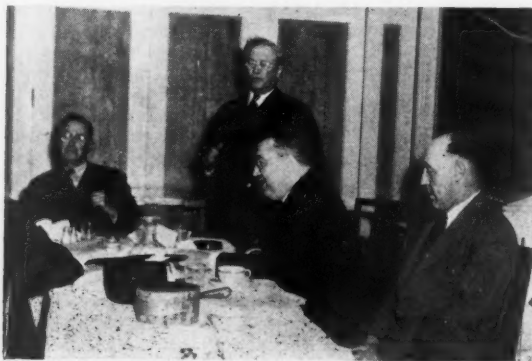
There will be no exhibits, no entertainment, and no loss of time at this Conference. It is scheduled in the middle of the week when traveling is normally easier than on week-ends. Nevertheless the railroads recommend that tickets be purchased both ways at least a month in advance in order to make sure that the transportation facilities will be available when needed.

## CHICAGO CONTRACTORS GET TAX REBATE

Current excitement among Chicago's electrical contractors is the recent windfall of credits they are receiving from their wholesalers. Such generosity was motivated by a recent Supreme Court decision against the State of Illinois collecting a sales tax on materials purchased by contractors and installed by them as a "service organization."

It all started way back when the State of Illinois levied a sales tax (occupational tax) on all commodities purchased for resale. The contractors felt they were not subject to tax on their material purchases because they were not reselling, but installing such equipment in connection with a service they were rendering. In due time a test case was prepared and taken into court.

The first break came Feb. 14, 1941, when Judge Fisher, of the Circuit Court of Cook County, ruled that contractors were not



**LEAGUE round table at Denver conference reviewed job of reestablishing electrical industry relations in post war era. Guy W. Faller, (standing), G. B. Buck and J. W. Alexander were among the Rocky Mountain Electrical League executives active in the discussion.**

# THE COMPLETE LINE OF WAGNER MOTORS, TRANSFORMERS *and* BRIDGE BRAKES WILL HELP YOU KEEP WAR PRODUCTION ON TIME!

It takes plenty of dependable motors, transformers, and bridge brakes operating at top efficiency to maintain the high-speed production so necessary in our "all-out" war effort.

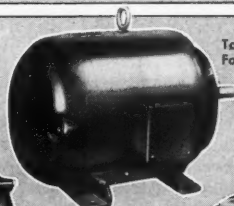
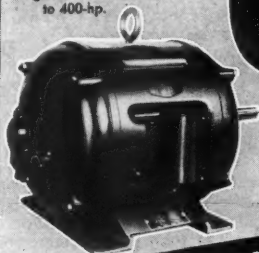
Wagner fully realizes this, and is working day and night turning out these items, supplying them wherever they are needed to help win this war.

If you need motors, transformers or hydraulic bridge brakes, consult Wagner.

## MOTORS

Wagner motors are built in a wide range of types and sizes with electrical and mechanical characteristics to fit the requirements of all types of motor-driven machinery and equipment. Bulletins MU-176, MU-182 and MU-183 illustrate and describe the complete line of Wagner motors. Everyone responsible for the purchase and maintenance of motors should have these bulletins.

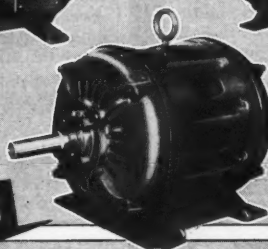
Polyphase Squirrel-Cage Motors — 1/6 to 400-hp.



Totally-Enclosed Fan-Cooled Motors — 1-1/2 to 125-hp.

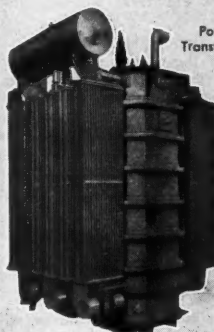


Explosion-Proof Motors — 3/4 to 125-hp.



Multi-Speed Motors — 1/2 to 125-hp.

## TRANSFORMERS

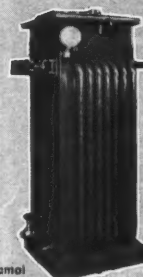


Power Transformer



Constant-Current Regulator

No matter what the requirement may be, Wagner can furnish the right transformer for the job. The line includes power transformers, distribution transformers, NoFlamol transformers and constant-current regulators. Bulletins TU-180 and TU-181 give complete information on the line of Wagner transformers. These bulletins contain information of value to every transformer user.



NoFlamol Transformer (Non-Inflammable Liquid-Filled)



Distribution Transformer

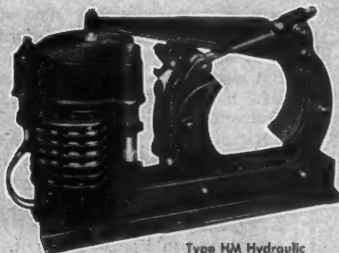
## BRIDGE BRAKES

### FIELD ENGINEERING SERVICE!

• 25 sales and service branches are located throughout the country. Trained field engineers are always ready to assist you in selecting motors, transformers, or hydraulic bridge brakes, to meet your particular requirements.



Type H Hydraulic Bridge Brakes



Type HM Hydraulic Bridge Brakes

Today, Wagner hydraulic bridge brakes are standard equipment on most overhead cranes. They are ideal for new installations as well as conversions from mechanical brakes. Available in type H for inside cranes, and type HM for outside cranes where automatic parking attachment is desirable. You should have bulletin IU-20. It will be sent on request.

## Wagner Electric Corporation

6400 Plymouth Avenue, Saint Louis, Mo. U.S.A.

MOTORS • TRANSFORMERS • FANS • BRAKES

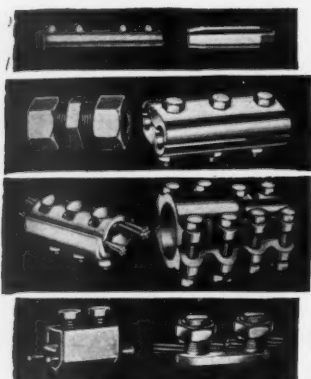


**"It sure is  
HANDY—  
to have ALL kinds  
in One Catalog!"**



**For any good Straight  
or Parallel Connector,  
see the COMPLETE line**

These illustrations can only suggest the wide variety in the Penn-Union Catalog . . . a complete line of Bolted Straight Connectors and Reducers . . . Screw type . . . Split Sleeve type . . . Shrink fit . . . Universal Parallel Clamps . . . E-Z Connectors that take a wide range of conductor sizes.



Also . . . the most complete line of Service Connectors, Tee Connectors, Cable Taps . . . Elbow and Cross Connectors . . . Bus Supports, Clamps, Spacers . . . Grounding Clamps, Terminal Lugs.

Penn-Union connectors are the first choice of leading utilities, industrials, electrical manufacturers and contractors—because they have found that "Penn-Union" on a fitting is their best guarantee of Dependability.

**PENN-UNION  
ELECTRIC CORPORATION**  
ERIE, PA. Sold by Leading Jobbers

**PENN-  
UNION**  
Conductor Fittings

*In the News*

[FROM PAGE 14]

liable to the state for the tax on their material purchases, nor were the supply houses liable to the State for taxes on such material sales to contractors. The State's appeal to the Supreme Court held Judge Fisher's ruling in abeyance.

The State plugged this loophole on July 1, 1941, by an amendment making all material purchases for installation by "service organizations" subject to the tax. Efforts to collect the tax from contractors and their wholesalers from Feb. 14 to July 1, 1941 were suspended, pending the decision of the Supreme Court.

Immediately following the Circuit Court decision, members of the Electrical Contractors Association of City of Chicago and the Cook County Electrical Contractors Association made an agreement with individual electrical wholesalers. This stipulated that the contractors would continue to pay the tax and the wholesalers would place this money into an escrow fund deposited in a separate account. If the Supreme Court reversed Judge Fisher's ruling, this money would go to the State; if it affirmed the decision, the tax paid between Feb. 14 and July 1, 1941 would be refunded to the contractors.

The contractors' second break came Sept. 21, 1942, when the Supreme Court upheld Judge Fisher's ruling and the State lost 4½ months' sales tax on contractors' purchases. Contractors in the agreement will get their refund, based on the date of the invoice, either in credit or cash.

Some who have already billed their wholesalers accordingly, are now grinning at the checks on their desks. Others are busy clearing up the details so their rebates will be forthcoming.

## WAR BOND PLAN FOR ELECTRICIANS

Purchase of war bonds on a regular payroll deduction plan for men employed by the day by an electrical contractor has been difficult if not impossible up to now. Regularly employed men on steady payroll could buy war bonds under such a program. But electricians work a few days for one man, then possibly a few days for another contractor and the problem of keeping track of salary deductions becomes complicated. Yet wiremen are earning higher wages than ever before and it was felt by the San Francisco Electrical Contractors Association and IBEW Union No. 6 that something could be worked out.

In cooperation with the War Savings staff of the U. S. Treasury Department, particularly Robert P. Etienne, the plan developed resulted in the establishment of "The Electrical War Bond Savings Bureau." This bureau is housed at the San Francisco Contractors Assn. headquarters but is administered jointly by a committee composed of two contractors and two mem-

## KNOW ELECTRICITY AS EXPERTS KNOW IT



## —AND GET AN EXPERT'S PAY

What about your future? Who is safe today? Surely not the man who is contented to stand still! Know your job thoroughly—prepare yourself for jobs ahead. To do just this thousands of men have used

## The CROFT Library of Practical Electricity

7 Volumes, 2906 pages  
1948 how-to-do-it illustrations

● The Croft Library is a complete electrical educator. It is founded on practice—on 20 years of shirt-sleeve experience—on work as it is actually done. It is jammed from cover to cover with the kind of hardheaded facts you want. Written so that the beginner can easily understand it, yet so sound, so thorough, that it is the daily guide of 59,000 highly paid electrical workers and engineers.

● Croft tells you the things you need to know about motors, generators, armatures, commutators, transformers, circuits, switchboards, distribution systems—electrical machinery of every type—illumination in its every phase—the most improved methods of lighting—lamps and lamp effects, etc.—how to do a complete job, from planning it, to completion.

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EASY PAYMENTS  
10 DAYS' FREE EXAMINATION**

Fill in and mail the coupon below and we will send you the entire set of seven volumes for ten days examination on approval. We will take all the risk—you assume no obligation. If you decide to keep the books, send \$3.00 in ten days and the balance at the rate of \$3.00 a month.

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### EXAMINATION COUPON

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You may send me the seven volumes of the Croft Library of Practical Electricity for 10 days' examination. I agree to return the books, postpaid, in ten days or remit \$3.00 then and \$3.00 a month until the special price of \$18.00 has been paid. (To insure prompt shipment, write plainly and fill in all lines.)

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Position .....  
Name of Company ..... E.C. 1-43

Electrical Contracting, January 1943



# FOR VICTORY TODAY AND SOUND BUSINESS TOMORROW



## ***Get This Flag Flying Now!***

This War Savings Flag which flies today over companies, large and small, all across the land means *business*. It means, first, that 10% of the company's gross pay roll is being invested in War Bonds by the workers voluntarily.

It also means that the employees of all these companies are doing their part for Victory . . . by helping to buy the guns, tanks, and planes that America and her allies *must* have to win.

It means that billions of dollars are being diverted from "bidding" for the constantly shrinking stock of goods available, thus putting a brake on inflation. And it means that billions of dollars will be held in readiness for post-war readjustment.

Think what 10% of the national income, saved in War Bonds now, month after month, can buy when the war ends!

For Victory today . . . and prosperity *tomorrow*, keep the War Bond Pay-roll Savings Plan rolling in *your* firm. Get that flag flying now! Your State War Savings Staff Administrator will gladly explain how you may do so.

If your firm has not already installed the Pay-roll Savings Plan, *now is the time to do so*. For full details, plus samples of result-getting literature and promotional helps, write or wire: War Savings Staff, Section F, Treasury Department, 709 Twelfth Street NW., Washington, D. C.



Save With

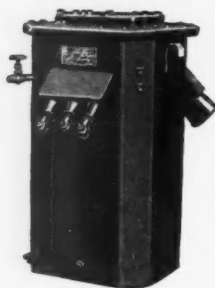
## **War Savings Bonds**

This Space Is a Contribution to America's All-Out War Program by

**ELECTRICAL CONTRACTING**



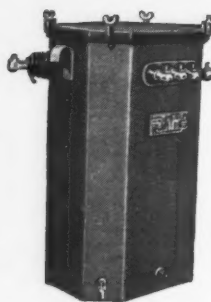
Get Uptegraff information or Bulletins on all your Transformer requirements.



Uptegraff type AD Non-Inflammable Distribution Transformer.



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## TRANSFORMERS

Serving Electrical Contractors, by designing and building Transformers of every type, in capacities as desired—in strict accordance with the highest applicable standards. An Uptegraff Transformer means "Quality and Service."

Tell us your requirements or send for Bulletins on types of Transformer desired.

**R.E. UPTEGRAFF Manufacturing Co.**  
SCOTSDALE • • • PENN'A • U.S.A.

## SPECIFY *Compco* FLOODLIGHTS for SAFEGUARDING MATERIALS and MANPOWER

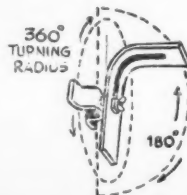


ANOTHER  
**Compco**  
QUALITY PRODUCT

Other Compco products, well known for their high quality, enduring service and plus-value include fluorescent lighting fixtures, incandescent lighting fixtures and indoor floodlights for industrial and commercial use.

Sabotage is prevented *before it happens* when Compco Floodlights are on the job. No intruder can pass within range of these luminaires without fear of detection. Not only are man hours safeguarded, but night materials handlings are speeded up. Here's an item you can specify in quantity! You'll get them —on time!

Available For Better Floodlighting with a baked-on white "liquid plastic" reflector and baked-on industrial grey outside finish, three sizes. Write or wire for specification sheet and prices.



Full up and down adjustment in any radius at any point.



**COMMERCIAL METAL PRODUCTS CO.**  
2251 W. ST. PAUL AVE • PHONE ARMITAGE 1123 • CHICAGO, ILL.

*In the News*

[FROM PAGE 96]

bers of the union. This bureau becomes the clearing house for war bonds savings deductions made by the employer at the request of the employee. It is also the clearing house for purchases of bonds by the contractors themselves.

A pledge card has been distributed to all members of the union, both by the employers and by the union itself. The card authorizes the bureau to notify employers to deduct 10 percent from earnings every pay period and mail such deduction to be deposited to his account for the purchase of Series "E" War Bonds. The card also designates to whom the bonds are to be registered and the beneficiary.

Employers are notified by the bureau of the list of those from whom deductions are to be made. In making out a weekly payroll report, a form is sent to the Bureau containing the names of employees, their social security numbers, their wage rates and the deduction for bonds. The contractor then totals the deduction list, makes a check out to the bureau and mails it with the report.

The bureau purchases bonds to the account of those for whom it has sufficient deposits once each month. The entire transactions are carried on by check, the bureau handling no cash.

Members of this bureau selected by the Association and the union are: C. B. Kenney, chairman, and Clyde L. Chamblin, secretary, contractor members; and Michael Lynch and William Gimmel, representing the union.

Treasury Department officials looked upon this as a model plan to be applied to the construction industry and other industries in which the same employment and time conditions apply.

## CHICAGO MOTOR SHOP GROUP ELECTS '43 SLATE

The Electric Motor and Service Association, Central District Chapter, NISA, Chicago, recently held an election of officers for 1943. After the ballots were stacked and tabulated, B. R. Hohman, Hohman & Hill, Inc., emerged as president; and Arthur Wagner, Sr., Arthur Wagner Co., vice-president. Joseph Ferarri, Excel Electric Service Co., Inc., is the retiring president.

Other officers elected on the same ballot included: secretary, Charles Dahl, Dahl Electric Co.; treasurer, incumbent James J. Smat, Queen City Electric Company. Members chosen for the Executive Board were: two years—E. P. James, Northwestern Electric Co., and E. J. Ther, Ther Electric and Machinery Co.; one year—Cary Boyer, Boyer Electric Co. Present Board members serving unexpired terms are Charles Kaska and Carl Sievert.

The greater portion of the meeting was

devoted to a round table discussion of wage and salary ceilings, Controlled Materials Plan, the Manning Table Plan and the inevitable gasoline rationing problem.

Genial Murray H. Ramsay, Assistant to the Regional Director, Wage and Hour and Public Contracts Division, U. S. Dept. of Labor, told the boys what they could and could not do with respect to wage increases in their shops.

Pete Maher, priorities and regulations expert of Excel Electric Service Co., Inc., outlined the CMP and the Manning Table Plan. The five-hour session wound up with a discussion of a method of exchanging magnet wire between members during an emergency.

## HOUSING FOR MINERS SCHEDULED

Federal funds have been made available for construction of 2,000 dwelling units for non-ferrous metal miners in seven western states. The War Production Board has granted a blanket priority for the housing, John B. Blandford, Jr., Administrator of National Housing Agency has announced.

To cover construction costs, the administrator has allocated \$6,000,000 to the Federal Public Housing Authority, a unit of the NHA, which will build the new accommodations.

This emergency program was decided on by the War Manpower Commission, the War Department and the National Housing Agency to alleviate conditions in certain mining communities where critical housing shortages threaten to interfere with production of essential non-ferrous metals. The War Production Board, and Federal Public Housing Authority along with WMC and NHA each have assigned a representative to cooperate in deciding in the field where the dwelling units will be located and what type of structures will be built.

The states covered by the order are Arizona, Colorado, Idaho, New Mexico, Nevada, Utah and Wyoming.

## NISA BOOSTS MEMBERSHIP

The National Industrial Service Association membership drive is rapidly gaining momentum and bringing in shops even beyond the continental limits of the United States. One of the most recent members is Milton H. Faber, owner of the Faber Electric Company located at Dr. Betances St. No. 1, San Juan, Puerto Rico.

In the U. S. proper, two new chapters were recently organized. The first was the rebirth of the Virginia-Carolinas Chapter at Greensboro, N. C. About 35 companies from five states—Virginia to Florida, were present. If other members in Georgia and Florida agree, chances are that this group will be expanded into a Southeastern Chapter. R. E. Ward, Electric Motor and Repair Co., Raleigh, N. C., was elected president of this unit.

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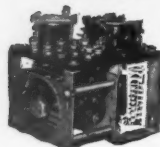
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Battleship U. S. Texas firing main battery broadside. U. S. Navy Official Photo.




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Now it's in the navy. The positive action, ruggedness and resistance to shock and vibration of this relay, make it ideal for alarm control, communication circuits and for the protection and timing of many kinds of equipment aboard ship. Manufacturers who are doing essential war production can often find items in the regular line of Ward Leonard Controls that will serve their needs without the delay of extensive redesigning.

WARD LEONARD ELECTRIC CO., 28 South Street, Mount Vernon, New York

**WARD LEONARD**  
RELAYS • RESISTORS • RHEOSTATS

Electric control  devices since 1892.

*In the News*

[FROM PAGE 99]

The other newcomer into the ranks was the Tennessee Chapter, organized at Knoxville, Tenn. The initial officers of this group include: president; H. E. Grant, Tennessee Electric Motor Service, Nashville; secretary, A. F. Anderson, Anderson's Inc., Nashville. President "Andy" Brown and executive-secretary Stewart Clarkson were present at both organization meetings.

### WARTIME

#### COUNSELOR SERVICE

The Northern California Electrical Bureau has recently established a wartime counselor service to help members who desire counsel and advice on their wartime business problems.

Members of the Board of Directors, who are particularly qualified to help solve the specific type of problem involved, have volunteered to serve on counselor committees on request. All the members need do is to inform the Bureau of their desire for such service.

### WAR SUBCONTRACTING IN KANSAS CITY

Under the sponsorship of the Electric Association of Kansas City, some 12 small manufacturing plants with previous experience in electrical work, have banded together to secure subcontract work from prime war contractors. A 30-page brochure issued by the Association and available to WPB and interested prime contractors, lists the members of the group together with pertinent data on their experience, capitalization, employees and machines. Net result: this small group is now busy making electrical parts for larger manufacturers of electrical equipment.

An outstanding example of how a motor service shop fits into this picture is John E. Launder's Independent Electric Machinery Company, which is now assembling more than 500 armatures and making, from start to finish, several thousand stator coils for one of the country's largest electrical equipment manufacturers. On the armatures Independent does only the assembly, picking up the component parts from other members of the group. One stamps out the rotor laminations; another turns the shafts; a third makes the end castings; and so on. Other firms in the group are making field coils and dozens of other electrical parts.

John Launder is the king pin and general ringmaster of the group, picking up loose ends here and there and making them all fit into an efficient cooperative working

group. And to top it all off, he had to set up a separate mass production coil winding department in his own shop to handle his subcontract work independently from his regular repair work. There may not be much profit in it for any of us but, if it will help our boys over there clean this mess up in a hurry, it's more than worth the effort, concluded John, whose son is an officer in a field artillery unit.

This subcontracting group is showing what can be done by the "little fellows" when there is a healthy spirit of cooperativeness and a genuine desire to do all that can be done to help the war effort.

## PLANNED WIRING FOR WAR HOUSES

The Electric Association of Detroit is making Victory Wiring Systems for its second batch of 12,000 defense homes covered by 17 typical plans prepared by the Builders' Association of Metropolitan Detroit. Previously, some 50 Engineered Wiring Layouts, similar to those used in St. Louis, were made for the first group of 11,225 living units constructed, resulting in a saving of some 21 tons of copper.

Biggest copper saver was rearranged circuiting which made use of a range circuit feeding a distribution cabinet in the kitchen. By doing this, a house could be wired, including an electric range, with less critical material than the former way without a range. The plan has the approval of the Federal Housing Administration and James Galbraith, head of the Electrical Inspection Department, City of Detroit.

The routine procedure set up by the Association to assist the builder in engineering his plans for FHA processing is as follows:

1. Plans from the builders are traced and outlets put on according to the WPB critical list.
2. The Engineered Wiring Layout is applied in yellow pencil to a print taken from this tracing.
3. The diagram is then transferred to the tracing of the Engineered Wiring Layout.
4. A bill of materials is prepared and a print of it accompanies the layout.
5. Prints of the wiring diagram and bill of materials are furnished the builder.

Association executives who have sponsored and developed the plan include C. G. Odell, executive manager; S. P. Ecclestone, president; N. A. Grams, vice-president; C. C. Munroe, treasurer and J. D. Petersen, secretary.

## CABLE SPLICING COURSE EXTENDED

Because of the outstanding success of a cable splicing school recently sponsored jointly by the Electrical Contractors Association of City of Chicago and Local B-134, IBEW, the course has been extended for another 10 weeks.



## Some day . . .

when we have fulfilled our Government obligations, we will be in a position to tell you fully the amazing story of the improvements that are being made in AmerTran products—today.

Today, wherever the new AmerTran products are being installed in connection with the war effort, electrical men are realizing that AmerTran is producing transformers that are new—new in electrical design, new in mechanical features, new in efficiency and economy.

**T**RUE, we have placed entirely at the disposal of the Government and customers with high priorities our new and greater plant capacity, our new and increased manufacturing facilities. But, as for the past 41 years, we are still glad to extend to you, without obligation, the advice of AmerTran Engineers to help you secure the best results from your present equipment, to help solve today's problems of operation and maintenance, and to plan for your future needs for transformers in all industrial and commercial applications.



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No more tiresome cranking of a hand-driven generator . . . Entirely self-contained, steady test potential of 500 volts DC, available at the touch of a switch. Direct reading in insulation resistance.



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VARIOUS NEW MODELS AND RANGES

WRITE FOR BULLETIN No. 430

## The Stone You Can Bend and Twist

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**DRESSES AND CLEANS ALL ELECTRICAL PARTS AND CONTACTS**

What a job FLEXSTONE does! Cuts like an abrasive stone—but you can bend, twist it. Won't break! Thin, non-brittle. Sharpest abrasives are pressed into flexible core. Easily fits tight places. Smooths hardest contact points in relays, cutouts — cleans small commutators, switches, etc. Non-conductor — no short circuit. Rimac FLEXSTONE speeds electrical service. Send for free sample!

**RINCK-McILWAINE, Inc., 16 Hudson St., New York, N. Y.**

*In the News*

[FROM PAGE 101]

The 12 journeymen electrician "students" who attended the first sessions started their second semester on Dec. 7. Previously they learned the fine points of "wiping joints." Now they will tackle the problems of actually making the conductor splices, and sealing, packing and insulating the joint. Chances are that when this course is completed the boys will sally forth into another advanced series of sessions designed to acquaint them with the methods of taping the joints and making all necessary tests.

The contractors association is receiving the wholehearted cooperation of the Commonwealth Edison Company and the Illinois Bell Telephone Company, in whose classroom and laboratory the classes are being conducted. The boys are practicing on scrap cable provided by the Edison Company while the Telephone Company is providing scrap lead for the project.

Classroom and laboratory instructors include: George W. Green, construction engineer, and Ben J. Borchardt, cable splicing foreman, both of the Commonwealth Edison Co.; and George Barrette, supervisor of the Telephone Company's cable splicing school.

### SPEED-UP APPRENTICESHIP PROGRAM

The Federal Committee on Apprenticeship has recommended to Chairman Paul V. McNutt of the War Manpower Commission that industrial establishments experiencing difficulty in manning apprenticeship systems be urged to give special



**LIGHTING MAINTENANCE** is necessary for good lighting efficiency, warned David Wood, Public Service Co., of Northern Illinois, as he addressed plant managers at a recent WPB lighting conference in Chicago.



consideration to "military personnel released from active service for physical reasons, or those ineligible for military service."

Because production must today be the only consideration in training all workers, including apprentices, employers were called upon to streamline their apprenticeship programs. Some of the methods suggested were moving quick-learning apprentices ahead as rapidly as openings occur; eliminating processes not essential to war production from the apprentice's work schedule; and giving a newly hired apprentice full credit for previous experience.

The Committee suggested that construction and service industries encourage apprentices drafted for military service to request assignment to branches of the Armed Services for which their apprenticeship experience best qualifies them.

## NECA COMMITTEES CONVENE

NECA Executive Committee and Labor Relations Committee will hold their mid-winter meetings in the National Headquarters in Washington, February 8-9. It is planned to hold open-house for NECA members at the new headquarter offices on February 7, with a rally meeting and luncheon immediately following in the new Hotel Statler. There will be several prominent speakers at this meeting and a general discussion of the many problems which face the industry at the present time, including relations with government departments.

NECA has just completed a mail ballot for the election of the Labor Relations Committee from four divisions. The following men have been elected for 3 year terms:

Division 3—W. Edward Frazer, Philadelphia, Pa.

Division 6—J. N. Pierce, Chicago, Illinois, re-elected.

Division 9—C. S. Chamblin, San Francisco, Calif., re-elected.

The representative from Division 10 has withdrawn making an election necessary for representation of one more year of the unexpired term and Grover C. Burke, Seattle, Washington, has been elected to this post for that division.

## POWER FOR SOUTHWEST

Another large Reclamation hydroelectric power plant has gone into action supplying energy for war industry, mining operations, and military use in the Pacific Southwest, according to an announcement by Secretary of the Interior Harold L. Ickes. The newest member of the Bureau of Reclamation power family is the Parker Dam plant in California-Arizona on the Colorado River, which has just begun generating power.

Two big 30,000 kilowatt generators at the plant have undergone test runs and are in commercial operation. Another generator of the same size, nearing completion of installation, is scheduled to start producing power later in the month and a fourth to be ready in May will enable the



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G-E Fiberduct distributes power where it is needed. The raceways can be tapped at any time for electrical connections. Your customers will like this flexibility. Machines can be changed at will. Whole production lines can be rearranged or moved.

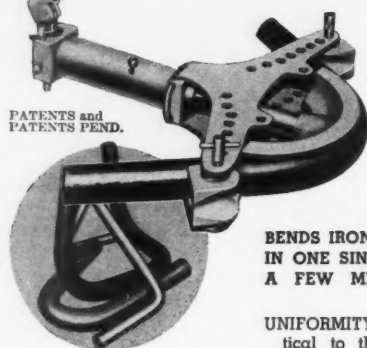
Inserts to accommodate outlets can be preset at the factory or set when the Fiberduct is installed or set at any later time. Ducts can be installed for power, for lighting or for signal systems.

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IN ONE SINGLE SIMPLE OPERATION IN ONLY  
A FEW MINUTES WITHOUT MOVING THE  
PIPE

UNIFORMITY OF BENDS: The last bend is identical to the first, even if made by "green hands".

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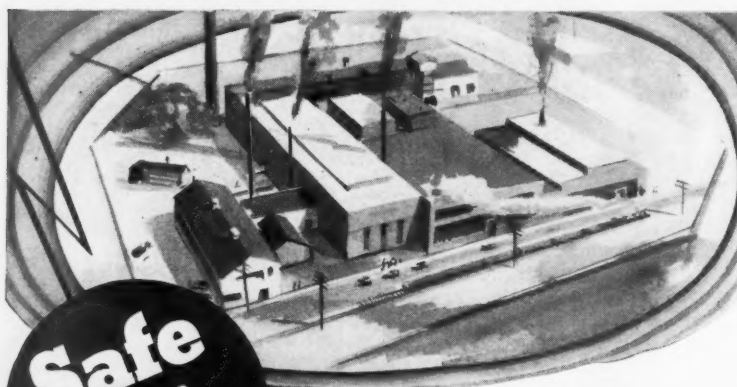
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*In the News*

[FROM PAGE 103]

plant's capacity of 120,000 kilowatts to generate 600 million kilowatt hours of electric energy annually.

Not only will the Parker Dam plant provide power for the production of vital war materials, but when peace is won, power will be available for the further expansion of cities, farms, homes and crops and for the development of mining and other industries in the Arizona and California Areas.

Original plans for the generation of power at Parker Dam did not contemplate a need for more than the initial installation of three 30,000 kilowatt generating units until 1950 or later. Skyrocketing demands for power for defense industries moved the operation schedule forward ten years and the fourth unit was ordered about a year ago for installation next May.

### COMING MEETINGS

**National Industrial Service Association Inc.**—War Conference, Netherland Plaza Hotel, Cincinnati, Ohio, January 26-27.

**National Electrical Manufacturers Association**—Spring Meeting, Palmer House, Chicago, Illinois, April 19-23.

**National Fire Protection Association**—Palmer House, Chicago, Illinois, May 10-14.

### ADJUSTING PRICES FOR WAGE RISE

Rules under which employers may seek price adjustments based on wage or salary increases requiring approval of the National War Labor Board have been prepared by the Office of Price Administration.

At the same time OPA issued a statement of detailed information for employers seeking the price adjustments, which emphasized that, in line with present adjustment policy, the price increases will be granted only when they are essential to prosecution of the war or "to a standard of living consistent with prosecution of the war."

The new procedure, set up in Supplementary Order No. 28 and effective November 18, covers the following principal points:

(1) The request for price adjustment must be made before the proposed wage or salary increases go into effect or OPA will not, at a later date grant price increases based on these grounds alone. (However, the fact that the employer failed to file such a request with OPA will not preclude recognition of the increased labor cost resulting from the wage or salary increases in considering any later application for adjustment or petition for amendment based on later changes in circumstances.)

*Electrical Contracting, January 1943*

(2) The employer should file his request for price adjustment with OPA within 15 days after the wage or salary increase application is made to the War Labor Board. In case of a disputed proceeding before the Board, the employer's request should be filed with OPA within 15 days after the employer receives notice that the War Labor Board has taken jurisdiction.

(3) The new procedure cuts across all price regulations and supplements those which already contain price adjustment procedures.

(4) The request for price increases must take one of two forms: Either an application for adjustment of individual prices or a petition for amendment of the applicable price regulation. The request must be filed in accordance with existing price and procedural regulations.

The new procedure implements the executive order issued by President Roosevelt on October 3, which provides that no wage increases requiring the approval of the National War Labor Board shall become effective without also being approved by Economic Stabilization Director James F. Byrnes in any case in which Price Administrator Leon Henderson "shall have reason to believe that the proposed wage increase will require a change in the price ceiling of the commodity or service involved."

An employer in a wage proceeding before the War Labor Board will be required to state whether he will ask a price increase based on the proposed wage or salary increases. This information will be forwarded to OPA by the War Labor Board.

But in order to enable OPA to determine whether the proposed wage increase will cause a price ceiling change it is also essential that the employer, who intends to make the proposed wage increase the basis for a request for increases in ceiling prices, shall file a formal request for the price increase before the wage increase becomes effective.

If the employer does not intend to make the proposed wage increase, if granted, the basis for a request for higher prices or if the prices are not subject to OPA control, there is no occasion for him to file any request with OPA. The wage case will then be handled by the War Labor Board alone and the wage increase will not need the approval of Economic Stabilization Director Byrnes.

The statement of information for employers emphasizes that OPA has set up standards strictly limiting cases under which requests will be granted. In outlining OPA policy on the subject it says:

"To avoid mistaken expectations, it is important for employers to realize that the situations in which individual price adjustments are permitted by OPA are extremely limited. It is important also to understand the reasons for this policy.

"The basic job of the Office of Price Administration is the establishment of price regulations of general application which are economically right in their relation to production for war and stability in the cost of living. This is in itself a huge task. The task cannot be performed if OPA tries also to establish a multitude of special prices for individual sellers. In even the best scheme of wartime price control, hardships are inevitable. It is impossible to correct

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100% POWER FACTOR at rated voltage. 98% or over within 85 to 135-volt range.



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## In the News

[FROM PAGE 105]

every departure from 'normal' price rela-  
tionships. Moreover, even when the hard-  
ship is severe and the departure one which  
ought to be corrected, it will usually hap-  
pen that the difficulty is one affecting a con-  
siderable number of sellers. In such a case  
it is the regulation itself which should be  
changed, not the prices of a few individual  
sellers. Piece-meal changes in single sell-  
ers' prices are impossible to make, under  
many regulations, without destroying the  
effectiveness of the regulation as a whole.  
But even where this difficulty is not present,  
such changes, if made in great numbers,  
create a complex and confusing pattern of  
price control. They present the danger of  
being unequal in their operation and result  
in the diversion of a large part of the lim-  
ited resources of the Office of Price Ad-  
ministration from the vital job of issuing  
and perfecting regulations of general ap-  
plication. Accordingly, the maximum prices  
of an individual seller will be adjusted in  
the most exceptional cases only.

"Special provisions for individual adjust-  
ment have been retained in some price regu-  
lations. In general these provisions permit  
individual adjustments only where action  
by general amendment is impracticable or  
undesirable or where, pending such an  
amendment, immediate action is needed to  
protect the supply of a commodity deemed  
essential for war production or vital to the  
civilian economy."

In fixing the time limit for filing with  
OPA at 15 days after the War Labor  
Board has the case, the order states that  
any request filed later than that will be  
taken under consideration by OPA only,  
if good reasons are shown for the delay.  
The 15-day limit also holds for applications  
for salary or wage increases filed with the  
Wage Adjustment Board of the Building  
Construction Industry.

To avoid mistaken expectations, accord-  
ing to OPA, it is important for employers  
to realize that the situations in which price  
adjustments will be permitted are ex-  
tremely limited.



**VISUAL DEMONSTRATION** of the  
effects of voltage drop and a discus-  
sion of unbalanced circuits was given to  
plant managers and maintenance men  
by John A. Harrington, Commonwealth  
Edison Co., at a recent WPPB lighting  
conference in Chicago.

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tical, usable data from all fields of elec-  
trical engineering practice, plus the most  
frequently required fundamental theory,  
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**1943 E-B-R**  
**ELECTRICAL BUYERS REFERENCE**

A service to facilitate  
the requisitioning and specifying  
of electrical and allied products

MANUFACTURERS'  
BRIEFALOGS

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DIRECTORY OF  
MANUFACTURERS  
CLASSIFIED BY PRODUCTS

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COMPANY AND  
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# E-B-R

**THE ELECTRICAL GUIDE FOR INDUSTRY AND GOVERNMENT AT WAR**



## USED MOTOR PRICING SIMPLIFIED

Changes in OPA regulations designed to simplify the calculation of maximum prices for used machines and parts were announced. They are as follows:

Used Machines and Parts. In calculating the price of a used machine or part, the seller now shall first ascertain the maximum price, f.o.b. factory, of the nearest equivalent new machine.

If the used machine is sold "rebuilt and guaranteed," the maximum price for the used machine, f.o.b. the seller's place of business, shall be 85 percent of the maximum price f.o.b. factory, of the nearest equivalent new machine.

If the used machine is sold on an "as is" basis, the maximum price for the used machine f.o.b. the seller's place of business, shall be 55 percent of the maximum price, f.o.b. factory of the nearest equivalent new machine.

Previously by interpretation, the maximum price of the used machine or part was calculated by a percentage of the delivered price of the new machine or part in the area of sale.

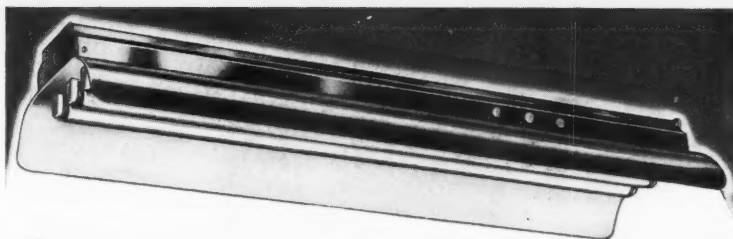
OPA pointed out that by the old method, the difficulty of determining the maximum price for a given second-hand machine was immeasurably increased, since the maximum varied with the location of the machine. It added that the prices provided by the Regulation were sufficiently liberal to compensate for any additional value of the machine arising from its being located far from the source of any replacement.

The new price-determining basis, in addition, brings calculations in line with Revised Price Schedule No. 1. (Second-Hand Machine Tools) which has always based maximum prices for second-hand machine tools on f.o.b. list prices for new machine tools.

The requirement that the price for a used machine or part must be f.o.b. the seller's place of business carries over into the regu-



**WAGE STABILIZATION** in the motor repair industry was weighed by genial Murray H. Rimsay, Assistant to Regional Director, Wage and Hour and Public Contracts Division, U. S. Dept. of Labor, as he led a round table discussion before Chicago motor shop representatives.



## "Skilled Lighting" Gives the Answer!

**Wheeler's new "War-Aid" RLM Fluorescent Fixtures retain top efficiency with Non-Metal Construction!**

No longer is there any need to worry about continued supplies of high-economy, production-boosting fluorescent fixtures for war plants! Wheeler **Skilled Lighting** now includes new "War-Aid" Fluorescent Fixtures made with a minimum of hard-to-get sheet metal. What's more, all the lighting efficiency of previous models is retained!

### New Non-Metallic Reflectors

Reflectors are made from a rugged, non-flammable, moisture-resistant non-metallic material. Reflecting surfaces of chip-proof, washable baked enamel have an enduring reflection factor of not less than 84% . . . provide minimum overall efficiency of 80% in 48" 2-lamp units, 73% in 3-lamp units and 73% in 60" 2-lamp units.

Wheeler "War-Aid" RLM Fluorescent Fixtures are available for Individual or Continuous Run installations.

### Get Complete Data

Write for full details of Wheeler Non-Metallic Fluorescent Fixtures and complete catalog of Wheeler Incandescent Fixtures. **Wheeler Reflector Company, 275 Congress Street, Boston, Mass. - New York - Cleveland.** Representatives in principal cities.

### Wheeler Non-Metallic Fluorescent Fixtures

- New Non-Metallic reflectors . . . sturdy, non-flammable, moisture-resistant.
- Chip-proof baked enamel finish . . . grey outside; permanent washable white reflecting surfaces.
- Provide full power-economy of fluorescent lamps, and undiminished overall lighting efficiency.
- Made for two or three 40-watt lamps, or two 100-watt lamps; in types for individual or continuous run installations.
- Reflector can be separated from wiring channel by loosening two thumb screws.
- Chain hangers prevent reflector body from dropping to floor. This feature permits quick and easy access to all operating equipment which is installed in wiring channel.
- No loose parts such as bolts, screws or nuts to handle.
- Fixtures can be mounted from chain, conduit, close to the ceiling, or can be provided with new "C" Clamp Slide Hanger.
- Design approved by Bureau of Standards. Performance guaranteed by RLM Standards Institute.

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**REFLECTOR  
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Lighting Equipment Specialists Since 1881





Simplex Insulated Wires and Cables must conform to war-time regulations now and "for the duration" but they retain the properties necessary for satisfactory service.

Into them we are putting the accumulated "know-how" of nearly sixty years devoted exclusively to making wires and cables with rubber, varnished cambric, impregnated paper and plastic insulations.

Shortages of many of the materials normally used in insulated wires and cables have seriously upset production schedules but expert use of what is available is breaking production bottle-necks caused by restrictions designed to conserve and control "critical materials."

The background of knowledge and skill built up during more than a half century now enables us to make the most of the limited materials we can get.

If you are doing essential, high priority war work and must have new cables we shall be glad to tell you more about Simplex cables and what they can do for you.

**Simplex WIRES and CABLES**  
Simplex Wire & Cable Co., 79 Sidney Street, Cambridge, Mass.

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*Electrical Connectors*

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APPROVED  
SINGLE HOLE  
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from maximum conductivity SEAMLESS copper tubing assuring you utmost quality.

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**ILSCO** COPPER TUBE & PRODUCTS, Inc.  
CINCINNATI, OHIO

**SIMPLET**  
**CONDUIT FITTINGS**

T thin wall fitting

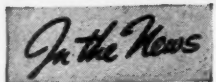
Special thin wall fitting

Universal vapor tight fixture

**No finer fitting made — All Styles — All Sizes**

Simplet engineers can help you with your sales problems—call on them today.

**SIMPLET ELECTRIC CO.**  
123 N. Sangamon St. Chicago, Ill.



[FROM PAGE 111]

lation a custom of the trade. This requirement is given substance by a new provision that if any sale is made on a "where-is-as is" basis, the buyer shall be reimbursed for the cost of dismantling or loading the used machine or part.

An exception is made, however, of the unusual case where the cost of dismantling and loading is more than 10 percent of the "as is" maximum price, as sometimes happens in the instance of such heavy equipment as travelling cranes, quarrying machinery, tanks, and industrial boilers. In such a case, the seller is required to reimburse the buyer only for 10 percent of the "as is" maximum price.

A clarifying change is made by the amendment in the instance of second-hand machines sold after so little use that there are no worn or missing parts that should be replaced or repaired for satisfactory operation. The regulation through amendment, now clearly states that a machine which is the equivalent of a rebuilt machine, but has not actually been rebuilt, may command the price of 85 percent of the nearest equivalent new machine or part.

In another change, the amendment modifies previous provisions so that Federal, State and local Government agencies, which cannot issue guarantees, may sell used machines that are the equivalent of "rebuilt and guaranteed" machines at the prices "rebuilt and guaranteed" machines would command. The Government agency now may substitute for the guarantee a certification by a qualified person satisfactory to the purchaser, other than a dealer, to the effect that all worn or missing components which should be replaced or repaired for satisfactory operation have been repaired or replaced, putting the machine in "rebuilt" condition.

Amendment No. 54, in a broadening pro-



**PRIORITIES SPECIALIST** Pete Maher, Excel Electric Service Co., Inc., Chicago, discusses all phases of government orders as they affect the motor repair industry at a recent meeting of the Chicago Chapter, NISA.

vision, extends its pricing procedure for second-hand machines and parts to certain other machines and parts, such as electrical wire, cable and cable accessories, and gears, sprockets and speed reducers, even though such items, when new, are sold under other price regulations than Maximum Price Regulation No. 136.

## TRUCK CERTIFICATE HANDLING DE-CENTRALIZED

The Office of Defense Transportation announced on December 23 that its central mailing office at Detroit, Michigan, had discontinued operations and that all matters pertaining to Certificates of War Necessity are now being handled by the regular ODT field force.

Henceforth, all applications for Certificates of War Necessity received at the Detroit office, as well as all correspondence pertaining to the ODT's mileage Rationing program for commercial motor vehicles, will be referred to the appropriate ODT district offices.

Owners of trucks, other commercial motor vehicles are urged to send no more applications or correspondence to the Detroit office but to take up all questions at once with their ODT field representatives.

For the convenience of vehicle owners who do not live near any of the 142 regular ODT district offices, the ODT is sending representatives into 500 additional cities and towns throughout the country. They will make their headquarters in local Chambers of Commerce and other civic centers.

Vehicle owners who have not received Certificates or who have not been allotted sufficient mileage and fuel for their necessary operations are urged to get in touch with these field representatives in their territory immediately.

Any truck, bus or taxicab owner can determine when an ODT field representative will be in his vicinity by watching the local newspapers or checking with the nearest Chamber of Commerce.

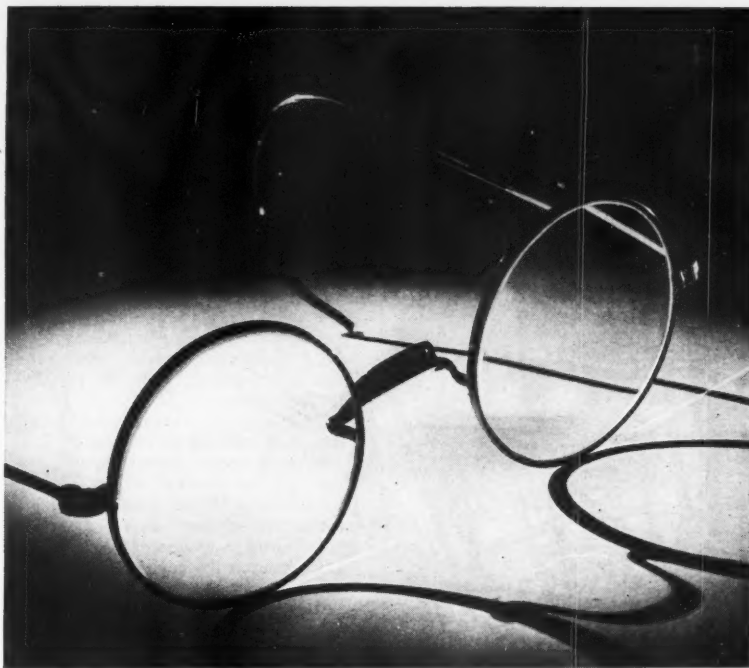
After January 31, fuel, tires and parts will be allotted only on the basis of the conditions set forth on the Certificate of War Necessity, and no more temporary transport rations, under which many vehicles are now being operated, will be issued.

ODT officials urged that all requests for adjustment of mileage and fuel allotments be made promptly. Unless requests are made in time to be disposed of before January 31, temporary suspension of operations may result.

At the same time, ODT officials emphasized that as long as the fuel and equipment is available, no necessary commercial motor vehicle operation will be crippled by the Certificate of War Necessity program.

Operators were urged, however, to request only as much fuel as will be needed to carry on their operations. If later adjustments are necessary, they can be made, it was pointed out.

A new amendment to the rationing regulations also authorized rationing boards to issue temporary rations in the following



## There will be FEWER OF THESE

Eyeglasses symbolize eyestrain. By reducing eyestrain through proper lighting, your war production can be increased both in quantity and quality. Fewer man-hours will be lost, fewer rejects will come off your production lines.

Silv-A-King offers a complete lighting service—fine equipment (either fluorescent or incandescent) plus skillful engineering to lay out your lighting installation for maximum effectiveness. Our ability to serve you well in lighting comes from 21 years of experience as industrial lighting specialists. A Silv-A-King lighting engineer is at your call wherever you are located.

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Write for new, 16-page Silv-A-King book:  
"Light Is An Essential Production Tool"

### A Few Typical Silv-A-King Users:

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INTERNATIONAL HARVESTER  
JONES & LAUGHLIN STEEL  
PITTSBURGH PLATE GLASS  
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SILV-A-KING MAKES *Light* WORK FOR YOU



**Danger**  
lurks in the  
shadows

Can you afford to take a chance with your man-power, your machines, or in spoiling critical materials, with inadequate light at point-of-work? McGILL Portable Wood Handle Guards reduce these dangers—by bringing light where it's wanted. There is a size and type to fit every requirement. They are handy, durable and soon save their cost. See your Electrical Wholesaler or write us for further information.

**McGILL**  
MANUFACTURING CO., Inc.  
VALPARAISO, INDIANA  
Electrical Division

## In the News

[FROM PAGE 113]

cases, in addition to those previously provided for:

1. Where a Certificate of War Necessity issued by the Office of Defense Transportation clearly does not allow enough gallonage to take care of the applicant's requirements through January 31. This provision was previously announced, although OPA boards in certain cases were authorized to issue temporary rations only through December 31.

2. Where a previously issued temporary transport ration is insufficient to meet the applicant's needs through January 31 and the applicant has not as yet received his Certificate of War Necessity and his application has not been denied.

3. Where a transport ration has been granted upon the basis of a Certificate of War Necessity and the ration is insufficient to fill the applicant's requirements through January 31, and where the appeal has not, as yet, been acted upon.

January 31 was set as the last date for issuance of temporary transport rations at the request of ODT which pointed out that action on appeals for larger rations than those allowed on the war certificates could be completed by that time.

## Priorities

### WPB BANS OVER-MOTORING

A purchaser of an electric motor must show that the horsepower of the motor he is applying for is no greater than that required to do the job, according to a provision in General Conservation Order L-221, announced by the Director General for Operation and which became effective December 10, 1942.

Restrictions on acceptance and delivery of orders.

1. No manufacturer or dealer shall accept any order for, or deliver, any motor or generator, and no person shall accept delivery thereof from a manufacturer or dealer unless: a) The purchaser shall have no idle motor or generator in his possession which is adaptable to the purpose. b) The purchaser shall have attempted to obtain, from at least three dealers, a used motor or generator for the purpose. c) The motor or generator is not purchased for replacement of existing equipment: and d) The motor or generator is required for installation within the shortest practicable time after delivery and is not for standby purposes. For the

### MINERALLAC HANGER



Conduit  $\frac{3}{8}$ "— $2\frac{1}{2}$ "

Cable to  $2\frac{1}{8}$ " (with Bushings)

Cadmium and Everdur  
**MINERALLAC JIFFY CLIP**



Sizes from .250" O.D. Tubing  
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### HOW TO handle every type of electrical job

—quickly  
—accurately



1600 pages, 1177  
illustrations, \$5

### Croft's AMERICAN ELECTRICIANS' HANDBOOK

Revised by C. C. Carr, Pratt Institute

This book is packed from cover to cover with the facts every man doing electrical work needs to have constantly at hand—from fundamentals of electricity to remedies for electrical equipment troubles. Helps you install commercial electrical apparatus and materials intelligently, operate electrical equipment efficiently, and maintain it at high operating efficiency.

#### 10 DAYS' FREE EXAMINATION

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Send me Croft's American Electricians' Handbook for 10 days' examination on approval. In 10 days I will send \$5.00 plus few cents postage or return book postpaid. (Postage paid on cash orders.)

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Company ..... F. E. C. 1-43

Electrical Contracting, January 1943



purpose of this subparagraph, a motor or generator shall be deemed installed (and not standby) equipment when it is connected to the purchaser's load and electrical system, notwithstanding that the purpose of such equipment may be emergency relief service.

Restrictions on types of motors. After December 10, 1942 no manufacturer or dealer shall accept any order for any motor; and after February 1, 1943 no manufacturer or dealer shall deliver, and no person shall accept delivery from a manufacturer or dealer, of any motor; unless the motor is in compliance with the following standards and is otherwise of the simplest practicable mechanical and electrical design.

1. *Mechanical and electrical design.* The following minimum standards shall be applied with respect to electrical and mechanical design:

a) No motor shall have a temperature rise less than 40° C, for open type; 50° C, for splash-proof type; and 55° C for totally enclosed type motors: Provided, however, that the temperature rise of the motor may vary from the above standards to the extent that the manufacturer has heretofore provided tolerance therefrom in his design and manufacture of the same or a similar type motor rated 40° C, 50° C, or 55° C, as the case may be.

b) No motor shall include a special enclosure to make it other than open type; except that (1) a motor may be explosion proof type if it is to be used in a Class I hazardous location, as defined in Paragraph 5005, Article 500, Chapter 5 of the National Electrical Code approved by the American Standards Association August 7, 1940; (2) a motor may be totally enclosed if it is to be used in a Class II hazardous location, as defined in Paragraph 5006, Article 500, Chapter 5 of the above Code, or if it is to be used generally in an atmosphere which is corrosive or which contains such quantities of material particles, dust or fumes as to be destructive of an open type motor; (3) a motor may be splash-proof type in any case where the motor is to be permanently installed outdoors without other protection or where the motor will be subjected to continually falling material particles, or to drops of splashing or jet propelled liquids.

c) Where practicable, a.c. polyphase motors shall be single voltage.

d) All alternating current multi-speed motors shall be single-winding; except motors for use in metal cutting machines.

e) No motor shall be of slipping type, except for hoist, crane, conveyor, elevator, tow, or dragline duty.

f) No motor shall be direct current type; except (1) where only direct current is available to the user; or (2) for use on a metal cutting machine or on testing equipment; or (3) where speed matching is required.

g) No direct current motor shall have a lower base speed than as prescribed below:

Horsepower rating:	Minimum base speed
1 to 5 incl.	600 rpm.
5.1 to 25 incl.	450 rpm.
25.1 to 75 incl.	400 rpm.
75.1-200	300 rpm.

2. *Horsepower Loading.* The following

To Make the Most of  
the LAMPS You Have...

Get the  
**CHAMPION  
MAINTENANCE  
MANUAL**



It's chock full of practical, usable helps and suggestions that will keep the electric lamps and lighting you now have at the peak of effectiveness. While they last, this handy Manual is yours for the asking. Write for Champion Manual A, giving your name, company and position.

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Champion Fluorescent and Incandescent Lamps are backed by forty-three years of specialization. They have an unsurpassed reputation for quality, dependability and economy. The Champion distributor in your vicinity is capable of filling your lamp needs at lowest cost. Prompt lamp replacement is a major factor in the maintenance of peak production efficiency.

**CHAMPION LAMP WORKS**  
*Lynn, Massachusetts*

A DIVISION OF CONSOLIDATED ELECTRIC LAMP CO.

## DONGAN TRANSFORMERS



### POWER CIRCUIT TRANSFORMERS DRY TYPE

ELIMINATE THE ADDED COST FOR SEPARATE LIGHTING CIRCUITS. REDUCE POWER CIRCUITS TO THE PROPER VOLTAGE FOR LIGHTING, OPERATING SMALL TOOLS, AND SIMILAR REQUIREMENTS.

WRITE FOR BOOKLET ON POWER TRANSFORMER CONSTRUCTION AND CONNECTIONS.

**DONGAN ELECTRIC MFG. CO.**  
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## CAPACITORS for

### Motor-Starting



- Keep those electric refrigerators going—for the duration at least. That's the patriotic thing to do, these days. And you can simplify your servicing of electric refrigerators by using Aerovox motor-starting capacitors as replacements when necessary. Adequate choice of exact-duplicate and universal types. Up-to-date listings tell you what replacements to use for most standard types of refrigerator motors.

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EXPORT: 100 Varick St., N. Y., Cable 'ARLAB'

## In the News

[FROM PAGE 115]

standards shall be applied in determining horsepower loads for motor ratings:

a) Horsepower required for purposes of ascertaining load as provided herein shall be determined by test or, where test is impossible, by careful calculation or comparison with known power requirements of similar apparatus.

b) Where the motor rated voltage will be maintained and the ambient temperature, normally, will be below 40° C, and will only occasionally, and for short periods, equal or exceed 40° C: (1) in the case of alternating current motors rated 40° C open type, continuous duty, the horsepower rating shall be not more than 80 percent of the determined horsepower load; (2) in the case of alternating current or direct current motors rated 50° C semi-enclosed, or 55° C totally enclosed, continuous duty, the horsepower rating shall be not more than 91 percent of the determined horsepower load; and (3) in the case of direct current motors rated 40° C open type, continuous duty, the horsepower rating shall be not more than 87 percent of the determined horsepower load.

3. *Speed.* The following minimum standards shall be applied in determining motor speed:

a) All alternating current motors, 25 horsepower and below shall have a synchronous speed of at least 1800 rpm. at 60 cycles (four pole winding), and corresponding speeds at other frequencies.

b) All other motors shall be of the highest practicable speed for the purposes for which purchased.

Certification. (1) Each person placing an order on and after December 10, 1942 with a manufacturer or dealer for delivery of a motor or generator, and each person who receives delivery of a motor or generator from a manufacturer or dealer on and after February 1, 1943, pursuant to an order placed prior to December 10, 1942, shall certify to the manufacturer or dealer, as a condition to receiving delivery, that all



**CRITICAL EYES** of instructor H. Hagg supervise electrician Louis H. Kaplan, Emerson-Comstock Co., Inc., Chicago, as he wipes a lead joint at a lead cable splicing school in Chicago.



**MOTOR SPECIALIST**, James L. Hardie, Sr., has charge of the motor service department of Hornbeck & Hardie Electric Co., St. Louis, Mo. Mr. Hardie lists the large refractories, boring mills and machine tool plants in that area among his largest customers.

applicable provisions of this order have been complied with.

In any case where an order relates to motors or generators of the identical kind and rating covered by a certification previously furnished to the same manufacturer or dealer, any facts included in the previous certification and which have remained unchanged may be incorporated in the certification required with respect to the current order by reference to the previous certification. (2) Such certification shall be signed by a duly authorized and responsible official, employee, or agent of the purchaser, and shall constitute a representation to the Director General for Operations, War Production Board, as well as to the supplier, of the facts certified therein.

Authorization of Director General for Operations. Application for the authorization of the Director General for Operations to deviate from the standards and conditions above shall be made by the purchaser or proposed purchaser of the motor (or by the manufacturer in any case where the motor is to be incorporated into other machinery manufactured by the same manufacturer) by letter or telegram or other communication addressed to the General Industrial Equipment Division, War Production Board, setting forth facts sufficient to enable the Director General for Operations to determine the necessity for such authorization. If granted, the authorization shall be transmitted by the purchaser to his supplier.

## WELDING RODS FOR MAINTENANCE

The limited control of the distribution of welding rods and electrodes effected by General Limitation Order L-146 has been abandoned on the issuance of a revocation of L-146.

When intended purchasers of welding rods and electrodes for maintenance and

*Electrical Contracting, January 1943*

repair work find it necessary to obtain preference ratings, applications for purchases of less than \$50 should be addressed to local offices of the War Production Board. Where more than \$50 worth of material is wanted the applicant should obtain approval from the Director General for Operations in Washington.

#### END-USE INFORMATION FOR ALLOCATION OF COPPER

Brass mills, copper wire mills, and copper foundries are cautioned by H. O. King, director of the Copper Division that they must continue to use the end-use classification symbols which were set up under Priorities Regulation No. 10.

While the allocation classification system was abolished recently, one of the terms of its abolition was that the Copper Division in its allocation of copper would continue to use the end-use symbols.

To avoid delays in delivery, all persons ordering copper and copper-base alloy products from mills and foundries are warned that they must provide as much end-use information as possible, including the ACS symbol number, so that their suppliers may obtain the necessary allocation of metal from WPB to fill their orders.

All mills are asked to communicate this information to their consumers.

#### RANGE SERVICES APPROVED

Restrictions on the construction of utility lines to furnish gas or electric service to domestic ranges are relaxed in Supplementary Preference Rating Order P-46-b as amended by the Director General for Operations.

Previously if the owner of a gas range moved into a house wired for an electric range, or if the owner of an electric range moved into a house piped for gas, it was necessary for the owner to acquire the type of range that would operate on the service already available in the house.

This has been changed to permit a utility to bring gas or electric service to the house to serve either a gas or electric range, provided the dwelling is not already equipped with a range of any kind. This allowed, however, only when a person moving from one house to another already owns a range which he is taking with him.

Provision also is made for service even where the applicant had not used a range previously, if the dwelling is not equipped with a range of any kind and if complete facilities for service to a gas or electric range have not previously been installed.

In either case, there is a limit on the amount of critical material which may be used. In the case of an electric range, not more than 15 pounds of copper may be used; in the case of a gas range, the connection may not use more than 75 feet of 1½-inch steel pipe or its equivalent in other sizes of pipe.

# PORCELAIN

*is Safe and Permanent*

## CONSERVES CRITICAL MATERIALS

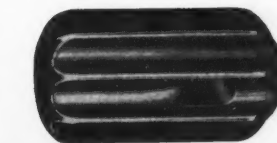
For home, commercial and industrial wiring, indoor and outdoor, porcelain insures complete insulation, permanence, and economy. Rusting and corrosion problems are eliminated—house service connections give you the most in safety.

Look into porcelain advantages now for the important jobs that you are going to do. See how the Illinois Electric Porcelain Company has made each of its products to be most adaptable and practical—easy to handle—easy to install.

Porcelain has been used for years. It is a material that has definite value, that is daily proving its long-lasting benefits. Its ability to handle high or low voltages, under all conditions, is fully recognized. Install Illinois Porcelain and Play Safe.



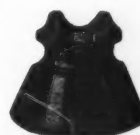
SPOOL INSULATORS



STRAIN INSULATORS



WIRE HOLDERS



DISTRIBUTION INSULATORS

**ILLINOIS ELECTRIC PORCELAIN CO.**  
MACOMB, ILLINOIS





## UNIVERSAL PRESSURE TYPE LUGS

Adjustable to Given Range of Wire Sizes

ONE OR TWO BOLT HOLES



Catalog Nos. 501 to 549

Each designed to accommodate conductors of various diameters, solid or stranded between sizes 4 to 2,000,000CM. Fitted with floating shield member that protects conductor against damage from binding screw. Makes tenacious grip on stranded conductors, forcing contact with each wire in strand thereby insuring utmost in conductivity—cast of copper alloy—contact surfaces ground. Both faces of lip parallel to each other.

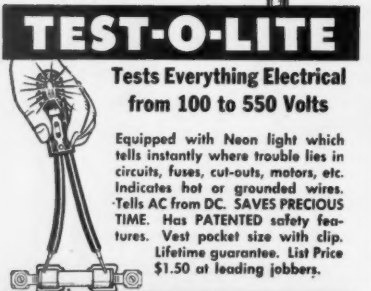
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211-E VINE ST. • CINCINNATI, OHIO



**SAFETY RULES** call for that EXTRA precaution and additional RE-CHECK which SAFE-T-GLOW provides. Detects accidental tie-ins, crossovers, leakages and induced voltages... prevents serious injury and loss of life. SAFE-T-GLOW consists of a sensitive Neon tube, amplified by mirror reflector.

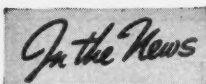
Model A for circuits 2,000 to 35,000 volts.  
Model B for circuits from 35,000 to 220,000 volts.



**TESTS Everything Electrical  
from 100 to 550 Volts**

Equipped with Neon light which tells instantly where trouble lies in circuits, fuses, cut-outs, motors, etc. Indicates hot or grounded wires. Tells AC from DC. SAVES PRECIOUS TIME. Has PATENTED safety features. Vest pocket size with clip. Lifetime guarantee. List Price \$1.50 at leading jobbers.

**L. S. BRACH Mfg. Corp.**  
55-63 Dickerson St. Newark, N. J.



[FROM PAGE 117]

## LAMP ETCHING RESTRICTED

Manufacturers of incandescent, fluorescent or glow discharge lamps are prohibited from etching a trademark or other identification on lamps for anyone but themselves or other manufacturers, the Director General for Operations has announced in an interpretation (No. 1) to order L-28-a.

The interpretation emphasized that lamp purchasers who are not manufacturers cannot have their trademark or other identification etched on lamps.

Also, the interpretation pointed out that the restriction on variety of bases for lamps imposed in Schedule A of the order applies only to design or shape of the base. Material content of any single type of base for a given lamp can be varied, so that it may be made of plated steel, plastics, or other permitted materials provided that the design, shape and size of the base is not changed.

## INDUSTRIAL EQUIPMENT AVAILABLE FOR MAINTENANCE

The acceptance of orders for, and production and distribution of general industrial equipment has been restricted by limitation order L-123 with the following exceptions:

1. An order bearing a preference rating of A-1-c or better.
2. An order for the Army, Navy, Maritime Commission, War Shipping Administration, Panama Canal, Coast and Geodetic Survey, Coast Guard, Civil Aeronautic Authority, National Advisory Committee for



**W. V. KAHLER**, Chief, Construction Branch, Production Division, WPPB, Washington, D. C., keynotes the conservation program before Chicago electrical engineers. Industry must simplify, substitute and salvage; the individual must save and sacrifice, he cautioned.

Aeronautics, and the office of Scientific Research and Development.

3. An order authorized by the Director General for Operations.

The restrictions are not applicable to any order for, or delivery of, maintenance or repair parts, (1) in an amount not exceeding \$1,000 for any single piece of general industrial equipment to be repaired or maintained; or (2) in any amount for the repair of general industrial equipment when there is an actual breakdown or suspension of operations of such piece of equipment because of damage, wear and tear, destruction or failure of parts, or the like, and the essential repair or maintenance parts are not otherwise available.

Any purchaser who shall place an order for repair or maintenance parts shall furnish his supplier with the following certification, on the order or in a separate document:

I hereby certify that the above (or attached) order is in compliance with paragraph (c) of General Limitation Order L-123. The order is for maintenance and repair parts as follows:

(state here whether order is for parts not exceeding \$1,000 for each piece of equipment covered thereby, or for parts for equipment which has broken down.)

Company

By \_\_\_\_\_  
(Authorized official)

Such certification shall be signed by a duly authorized official or employee of the purchaser. No person shall make delivery of repair or maintenance parts covered by such certificate if he has reason to believe that the certificate is false; and no person shall falsely furnish the certification specified above. The above mentioned certificate shall constitute a representation to the War Production Board, as well as to the supplier, of the facts certified therein.

## SPECIALIZED TRAINING COURSES

Five basic pre-induction training courses designed to supply men with fundamental knowledge of specialized Army occupations has been prepared by the War Department and the United States Office of Education and distributed to schools throughout the nation.

The course, covering the fundamentals of electricity, radio, shopwork, machines and automotive mechanics, have been sent to principals and headmasters of approximately 50,000 public, private and parochial high schools and to city, town and county superintendents of schools. The courses are designed not only for students of pre-draft age, but for those students of draft age or others who expect to be called into the service in the near future. They have three objectives.

1. To contribute substantially to the flow of trained manpower to the Army.
2. To help reduce existing critical shortages in men qualified for training in certain Army occupations.
3. To help free the resources of the Army for specialized technical military training.

*Electrical Contracting, January 1943*



**EXECUTIVE SECRETARY**, Stewart N. Clarkson, National Industrial Service Association, New York, told the Chicago Chapter, NISA, of the recognition the motor service industry has gained in Washington's WPB circles.

### COMMUNICATIONS SUPPLIES CUT

To permit greater use of reconditioned equipment in the wire communications industry, both as a means to save critical materials and to provide additional supplies of serviceable equipment, several minor revisions of Limitation Order L-148 have been announced by WPB.

The modified order substitutes an A-1-a preference rating instead of the A-7 minimum rating previously authorized for use by telephone and telegraph companies in obtaining new and used equipment for plant and lines. This action will not directly affect civilian use of telephones.

Provisions of the order affecting the sale, lease, or transfer of wire communications equipment are broadened so that manufacturers may now purchase and accept delivery of such materials from an operator or other person, without a preference rating, for the purpose of reconditioning used and defective equipment and parts.

Substantial quantities of second-hand equipment have been accumulated by operating companies which, if reconditioned and restored to use, would add appreciably to the capacity of existing facilities.



**AFTER DINNER HUDDLE** finds (L to R) Pete Maher, Excel Electric Service Co., Inc.; J. G. Lessel and A. A. Byers of Central Motor and Repair Co., Chicago, exchanging experiences on their latest problem—gasoline rationing.



**TAKING** care of tools is always a good business. In times like these, when our Armed Forces need every tool that can be produced to keep a mechanized war rolling, it is doubly important to look after those you have.

The high quality of Klein equipment assures long life.

Take care of your pliers and wrenches—take care of your grips and climbers—take care of your belt and safety strap. If they're Klein's, you are fortunate in possessing equipment that is designed to give you the maximum in service. Proper care will assure your getting that service.

ASK YOUR SUPPLIER. FOREIGN DISTRIBUTOR: INTERNATIONAL STANDARD ELECTRIC CORP., NEW YORK

Since 1857



**Mathias KLEIN & Sons**  
Established 1857 Chicago, Ill., U.S.A.

3200 BELMONT AVENUE, CHICAGO



## The Aviation Industry needs Seed Money

**THIS** Victory crop is sweet—10,000 planes per month next year seem certain . . . 5,000 per month already passed . . . Worldwide average of four enemy planes knocked down for every American plane lost . . . Jap average five to one . . . Still better planes coming off the line.

And beyond the war, some people see a vast new industrial field opening up for America:

► Giant freight and passenger airliners, flying the airocean to every part of the globe, linking our cities in a traffic network that will obliterate time.

Family planes that will jump golfers to far off greens.

What are the chances for this exciting post-war crop of commerce and convenient travel from our aviation industry?

We think the chances are rather slim, and we ask you to take a serious look at the reason.

In our proper anxiety to prevent inflation and control war profits, we have passed tax laws that are taking away most of the "seed money" that aviation companies will need when the time comes to go it on their own in the post-war world.

► "Seed money" is that part of profit which is held for re-investment in a business to insure its growth.

"Seed money" will pay for research on new and

better products. It will pay for retooling when post-war models are produced. It will pay for the study of methods to get the lower costs that widen markets. It will pay for setting up new distributors and dealers, and for hundreds of other activities that are involved in the growth of a business.

► American industry has grown on "seed money." It has been a national characteristic to re-invest most of our profits in development.

A dangerous confusion between personal profit (salaries and dividends) and re-invested profit (which we have called "seed money") has found its way into our taxing system.

*The tax law, and government contracts, should allow American Industry to accumulate funds for the numerous tasks of post-war development.*

A sum greater than the total now remaining after taxes will be needed, if we are to take advantage of the new opportunities that will exist after the war.

It is probably the oldest law in economics that enough of each crop must be saved to provide seed for future crops.

Ask your Congressman to see that this economic law is not disregarded in an effort to take excess profits out of war.

*Reprints of this advertisement are available in handy booklet form.*

**McGRAW-HILL PUBLISHING COMPANY, Inc.**

330 WEST 42ND STREET

NEW YORK



# Did you ever try to defend a PROFIT?

**E**VERY business man knows the difference between profit that is paid out to individuals and profit that is held for re-investment and future growth.

The trouble is that the public thinks of profit in terms of yachts, elaborate homes and costly debutante parties. They have learned to think that way because those things get the headlines.

The public does not know that far more profit money has gone back into American business than has ever been taken out for personal spending.

The McGraw-Hill Publishing Company is going to do its share in the job of explaining the difference between these two kinds of profit.

To be sure that the public does not confuse two different things that have always been called by the same name, we have developed the term "Seed Money."

"Seed Money" is explained in the McGraw-Hill newspaper advertisement reprinted on the opposite page. We urge you to read this

advertisement carefully and apply its message.

There will be other McGraw-Hill advertisements on this vital industrial need. We hope, too, that other advertisers will adopt the term "Seed Money" and help by selling their employees in their own communities on the danger to living standards in taking away industry's ability to improve its plants and techniques.

★ ★ ★

## THE MCGRAW-HILL NETWORK OF INDUSTRIAL COMMUNICATION

23 publications, which gather "war-news" from the "war-production-front" through a staff of 153 editors and 725 engineer-correspondents... More than 1,500,000 executives, designers, production men and distributors use the editorial and advertising pages of these magazines to exchange ideas on war-production problems.

## THE MCGRAW-HILL BOOKS

Publishers of technical, engineering and business books for colleges, schools, and for business and industrial use.

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Aviation—(AMERICA'S OLDEST AERONAUTICAL MAGAZINE)—INFORMATION HEADQUARTERS FOR THE MEN WHO DESIGN, PRODUCE, OPERATE AND MAINTAIN AMERICA'S AIR SUPREMACY.

American Machinist  
Bus Transportation  
Business Week  
Coal Age  
Chemical & Metallurgical  
Engineering

Construction Methods  
Electrical Contracting  
Electrical Merchandising  
Electrical West  
Electrical World  
Electronics

Engineering & Mining Journal  
E. & M. J. Metal and Mineral Markets  
Engineering News-Record  
Food Industries  
Factory Management and  
Maintenance

Mill Supplies  
Power  
Product Engineering  
Textile World  
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AFFILIATED WITH BUSINESS PUBLISHERS INTERNATIONAL CORPORATION, PUBLISHERS OF BUSINESS AND TECHNICAL MAGAZINES FOR LATIN AMERICA, AND OVERSEAS CIRCULATION.



Two Piece Dome Reflector

Industrial Reflector

**MULTI**

**MULTI INCANDESCENT REFLECTORS**

*Designed for the job...*

MULTI Units need no introduction . . . they are in demand . . . they are necessary . . . they meet any lighting requirement . . . they are just right for customer and contractor.

• Send for Complete Catalog.

**MULTI ELECTRICAL MANUFACTURING CO.**

1840 W. 14th St. Chicago, Ill.

 **Save Time and You Speed Up VICTORY!**



Sherman Solderless Lugs can be assembled in a jiffy, and they make a tight, permanent connection! Extra thread plate for strength. Floating pressure pad attached to screw. Serrated gripping surfaces. Sizes up to 500m CM. Underwriters approved. Write for catalog.

H. B. SHERMAN MFG. CO.  
BATTLE CREEK, MICH.

**Sherman SOLDERLESS LUGS**

*In the News*

[FROM PAGE 119]

### USABLE MOTOR MUST GO TO WORK

In an effort to put every usable motor in the country to work producing war materials, the WPB is appealing to manufacturers who have idle motors to make them available for sale and to all manufacturers to use their motors to best advantage and for as long as possible. The recently issued General Conservation Order L-221 is designed to encourage maximum use of existing motors and to conserve materials in future production.

Ninety-five percent of the weight of every motor manufactured is iron, steel, aluminum and copper, the four critical and basic materials being allocated for only the most essential purposes by CMP. The other five percent is made up largely of mica, shellac, and similar materials which are equally scarce. Thousands of pounds of those materials must be diverted from the production of shooting equipment and thousands of man-hours are used each month to manufacture new motors.

In the meantime, hundreds of thousands of usable motors, manufactured in peacetime when materials were plentiful, lie idle in civilian goods plants closed down for the duration of the war, stand half-forgotten in factory storerooms, or are being held in too large quantities for emergency use.

In discussing the intent of the new order, John Gammell, Chief of the Electrical Equipment Branch of the General Industrial Equipment Division, said that many types of used motors are available and the country's industrial facilities should not be wasted in producing new equipment while usable motors are idle.

Said Mr. Gammell, "These idle motors must be put to work turning out shooting weapons. We cannot afford to produce new motors while used ones are available. It is the responsibility of every manufacturer to put his 'slacker' motors to work or to sell them to someone who needs them. One of the main purposes is to encourage the full utilization of new idle motors."

— WITH THE —  
*Manufacturers*

### G-E Changes

Dean M. Warren, in charge of technical publicity at General Electric's Nela Park, Cleveland, has been transferred to the Empire Division of the G-E lamp department at Buffalo. Mr. Warren will devote full time to wartime lighting of industries in the Buffalo area.

George J. Taylor, industrial lighting engineer at Nela Park has been promoted to the post of wartime lighting engineer at the company's Atlantic Division, New York City. Mr. Taylor will work closely

## How to save time by doing more reading

That is a profitable paradox for you. More true today than perhaps ever before. For here in the pages of this publication are packed many helpful ideas . . . considerable useful information. Much of it, in fact, available from no other source.

And we most emphatically mean *both* the editorial and the advertising pages.

Just one new idea gleaned from these pages . . . a method for doing something better or faster or easier or at lower cost, may alone save you far more than a year's reading-hours invested in this and other worthwhile business papers.

Many people have found this a fact . . . not only once, but time and time again. That's significant . . . with time so precious today.

★  
Good advertising speeds information from those who have it . . . to those who need it.

★  
**McGraw-Hill Publishing Company, Inc.**

330 West 42nd Street New York

with the many government war production authorities who recently have been transferred from Washington to the New York-Newark area.

### Crocker-Wheeler Announcement

Charles E. Moore, president of the Joshua Hendy Iron Works, has announced the purchase by his company of the Crocker-Wheeler Electric Manufacturing Company of Ampere, N. J. This company will operate as a division of the Hendy Iron Works.

W. L. Buchanan has been appointed field manager of Renewal Parts Sales of the Crocker-Wheeler Electric Manufacturing Co. Mr. Buchanan's headquarters will be in the Chicago office.

Sylvania Electric Products, Inc., has appointed Robert H. Bishop, formerly Eastern sales manager of the Lighting Division, to the post of general sales manager. Mr. Bishop's headquarters will be at the New York office, 500 Fifth Avenue.

Mr. Bishop takes over from Charles G. Pyle, who recently resigned to accept an appointment as managing-director of the National Electrical Wholesalers Association.

Graybar Electric Co., New York, announces the retirement of D. C. Guest as sales manager of the Outside Construction Department and the appointment of L. W. Taylor as sales manager of this department, replacing Mr. Guest.

Westinghouse Electric & Manufacturing Company has transferred its X-Ray Division from Long Island City to 2519 Wilkens Avenue, Baltimore, Md.

Brown Company, Berlin, N. H., announces the election of Harry E. Houghton as vice-president in charge of sales.



**ENGINEERS** must conserve materials in the design, application and installation of electrical equipment, warned H. S. Osborne, national president AIEE, as he outlined a broad conservation program to the Chicago Chapter, AIEE.

## WHERE TO BUY

Equipment, Materials and Supplies for  
Electrical Construction — Maintenance — Repairs

### DRILLS CONCRETE—METAL—WOOD



#### WODACK "DO-ALL" ELECTRIC HAMMER AND DRILL

Saves time and money installing expansion anchors. Drills concrete to 1 1/2" dia.; metal to 3/4". Two tools in one. Easy to maintain. Universal motor. Write for folder.

Wodack Electric Tool Corporation  
4628 W. Huron St. Chicago, Ill.  
Telephone AUstin 9866

### "FRIGID" VENTILATING EQUIPMENT

Circulators, Exhaust Fans,  
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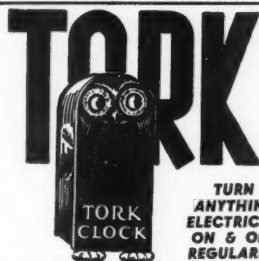
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## ELECTRICAL CONSERVATION

### MEANS FUSING WITH LITTELFUSES

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1/100 to 8 amps, 250 volts. Wide industrial application. Data available.  
LITTELFUSE INC. 4789 Ravenswood Ave. Chicago, Ill.

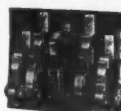


The TORK CLOCK CO., Inc.  
MOUNT VERNON, NEW YORK



Transfer from normal to emergency service is really instantaneous with

### ZENITH IMPROVED AUTOMATIC TRANSFER SWITCH



All contacts on one shaft, operate in same direction. Electrically held. No "off position" possible. A.C. to A.C., A.C. to D.C., any combination, 1, 2, 3, 4-pole types, 18 capacities, 30 to 400 amps. Send for Zenith Catalog.

ZENITH ELECTRIC CO.

845 S. Wabash

Chicago, Ill.

### Your inquiry

will have special value . . .

If you mention this magazine, when writing advertisers. Naturally, the publisher will appreciate it . . . but, more important, this proof of active reader interest will demonstrate to the advertiser the usefulness of—and demand for—the vital service rendered by his advertising.

### "Jiffy" HOLE CUTTER



Cuts round holes, quickly, easily and accurately in steel boxes.

Write for circular.

CLYDE W. LINT

102 So. Jefferson St. Chicago

## Whenever you need products

not advertised in a particular issue . . . ask the advertisers—or write us. We will gladly ask them for you.

This Where-to-Buy Section supplements other advertising in this issue, with these additional announcements of products essential to efficient and economical operation and maintenance. Make a habit of checking this page, each issue.

Departmental Staff, ELECTRICAL CONTRACTING, New York City



## SEARCHLIGHT SECTION

(Classified Advertising)

Employment Business

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### "OPPORTUNITIES"

#### UNDISPLAYED RATES

15 Cents a Word. Minimum Charge \$2.00. POSITIONS WANTED (full or part time individual salaried employment only), 1/2 the above rates payable in advance.

BOX NUMBERS—Care of publication New York, Chicago or San Francisco offices count as 10 words. DISCOUNT OF 10% if full payment is made in advance for 4 consecutive insertions.

#### DISPLAYED RATE

INDIVIDUAL SPACES with border rules for prominent display of advertisements. The advertising rate is \$7.50 per inch for all advertising appearing on other than a contract basis. Contract rates quoted on request. AN ADVERTISING INCH is measured 1/4" vertically on one column, 3 columns—30 inches—to a page.

NEW ADVERTISEMENTS received by January 27th will appear in the February issue, subject to limitations of space available.

#### POSITION VACANT

MAN WANTED: Man with college education, business experience, accustomed to responsibility, preferably with electrical manufacturing or sales background, for permanent position. Duties predominantly executive. Location Ohio. If your present business is subject to War curtailment, if you foresee advantage in shift to War-connected industry. Write P-37, Electrical Contracting, 520 N. Michigan Ave., Chicago, Ill.

**WE BUY AND SELL**

**MOTORS**

**TRANSFORMERS**

**MOTOR GEN. SETS**

**OIL SWITCHES**

**AIR CIRCUIT BREAKERS**

**ELECTRIC EQUIPMENT CO.**

670 Lake Ave., Bushong, N. Y.

Yonkers 6700

## Quick ANSWERS

to business problems . . .

MISCELLANEOUS business problems are daily being solved quickly and easily by the use of the Searchlight (classified advertising) Section of this and other McGraw-Hill publications.

When you want additional employees, want to buy or sell used or surplus new equipment, want additional products to manufacture, seek additional capital, or have other business wants—advertise them in the Searchlight Section for quick, profitable results!

American Machinist	Engineering & Mining
Aviation	Journal
Business Week	Engineering News-Record
Bus Transportation	E. & W. J. Markets
Chem. & Met. Eng.	Factory Mgt. & Maintenance
Coal Age	Food Industries
Construction Methods	Power
Electrical Contracting	Product Engineering
Electrical Merch.	Textile World
Electrical World	
Electronics	

Departmental Staff

McGraw-Hill Publishing Co., New York

## More Gossip

### On Furlough

John E. Launder, president, Independent Electric Machinery Co., Kansas City, Mo., recently had the pleasure of entertaining his son Lt. John E. Launder, Jr., who was home on a 15-day furlough from the armed services. Jack, who has had about a year of army life, is attached to the 302nd Field Artillery, 76th Division, Fort Meade, Maryland.

### Indianapolis E.M.E. Expands

Realizing the increased importance of electrical maintenance in our war industries, the Electric League of Indianapolis, Inc., plans to expand its Electrical Maintenance Engineers Division. Organization of a comprehensive program is under way to bring together the men in charge of maintenance work and to provide a practical vehicle for the exchange of experiences on methods for solving today's operating problems, materials shortages, priorities and so on.

Companies, themselves, will be enrolled as regular members of the Division and they, in turn, will sponsor their men in this activity. Present plans call for monthly meetings with panel and open-forum discussions of vital subjects of interest to this particular field.

The League is also scheduled to take an active part in a general Production Clinic, sponsored by various engineering societies in cooperation with the War Production Board on January 22.



MPR 251 was clarified by Harold G. Bangert, Regional Price Attorney, OPA, Chicago, in a recent discussion with the Cook County Electrical Contractors Association, Chicago. The contractors were invited to come to OPA with their problems on construction price control.

### Naval Air Cadet

Elton A. Gould, Jr., son of E. A. Gould, president, Gould Electric Co., Chicago electrical contractor, is now a Naval Air Cadet stationed at Iowa City, Iowa. "Bud", who formerly worked in his dad's engineering department, has a yen for flying and left for active service on Armistice Day.

### Essex E.M.E. Officers for '43

The Maintenance Division of the Essex Electrical League, Newark, N. J., recently chose Andrew Jacobus to replace retiring president William Craig. Other officers elected were: Arthur Post, vice-president; Bert Baker, secretary; and Victor Hoch, treasurer.

The members of this group are now attending a course on Human Relations, conducted by William Conrad. The primary objectives of the course are to teach the workers new skills, knowledge, and safety habits; how to deal with the human problems which interfere with production; how to lead an industrial conference; and the preparation of workers to assume the responsibilities of foremen and sub-foremen.

### Masters Overseas

Captain Walter J. Masters, former manager of the Essex Electrical League, Newark, N. J., and now an administrative officer in the U. S. Army Air Force is somewhere "over there" or "down under" as evidenced by his New York A.P.O. address. Jack's last letter said he was where the water was very warm and blue and that Scotch and soda, sans ice, and rum were the national drinks. Wonder where he could be.

### Utility Engineer Now With Contractor

Buhl and Caffrey, Inc., electrical contractors of Newark, N. J., have increased the personnel of their engineering department. Latest addition is Howard Snow, formerly in the Electrical Engineering Department of the Public Service Electric and Gas Company, Newark.

### Chamblin, Jr., Joins Engineering Firm

Garth Chamblin, son of Clyde L. Chamblin, California Electric Construction Co., San Francisco, who was partner with his father in the business until recently, has joined the engineering firm of Hudson & Grady, consulting electrical engineers, San Francisco. During the past year he has been on the design staff of Bechtel-McCone-Parsons Co. at the Marin shipyards.

Electrical Contracting, January 1943



# War Housing Critical List

Revised schedule of maximum allowances for electrical work on war housing as outlined in the new War Housing Manual.

## 110 Scope.—

This War Housing Critical List supersedes and nullifies the Defense Housing Critical List effective February 24, 1942. It is the list referred to in Preference Rating Orders P-55, P-110, P-19-d, and P-19-h for War Housing. It also constitutes an appendix to the Army and Navy Munitions Board "List of Prohibited Items for Construction Work." It is based upon the critical positions at the time of issuance, of materials essential to the construction, allocation, and equipment of housing.

Only the materials and products included in this list, and only in such limited quantities and for such limited uses as are herein specified or imposed by an applicable preference rating order, are eligible for procurement by the extension of a preference rating order granted for a housing project.

The following is the list covering electrical construction:

311 *Outlets.*—The number of outlets allowed for fixtures, snap switches, convenience and special-purpose receptacles for each dwelling unit shall not exceed the sum total calculated as follows:

- a. Bathroom—1 outlet.
- b. Kitchen—2 outlets.
- c. Separate dining room or dining space—2 outlets; dining space—2 outlets.
- d. Living room—3 outlets.
- e. Each other habitable room—2 outlets.
- f. Each private hall—1 outlet.
- g. One exterior entrance—2 outlets.
- h. Utility room—2 outlets.
- i. Basement, in dwellings which do not contain a utility room—2 outlets.
- j. Other areas and special-purpose outlets; number as determined for the individual case by the office processing the application.

The following items each count as one outlet provided the wiring device is installed in 1 outlet box; single snap switch—combination snap switch and convenience outlet—duplex convenience outlet—fixture outlet—combination fixture and convenience outlet—special-purpose outlet.

## 320 Service entrance.—

- 321 Nonmetallic service cables. (Type S. E.)
- 322 Moisture-resistant cables only for underground installation in nonmetallic service raceways. (Type U. S. E. without rubber jackets).
- 323 Service cable head.
- 324 Service equipment, panel boards and enclosures—nonmetallic materials or ferrous sheet-metal enclosures; nonmetallic coated sheet metal; zinc-coated sheet metal for exterior use or where embedded in exterior concrete or masonry. Copper or copper alloy for current carrying parts only. Over-current devices may be fuse or automatic type, thermal or magnetic.

## 330 Interior wiring.—

- 331 Covered neutral cable.

332 Insulated single conductors.

333 Nonmetallic sheathed cable.

334 Nonmetallic service cable—for range and domestic water-heater circuits and for feeders from a master-serving cabinet to supply other structures—wiring only permitted where this equipment is available for immediate installation. Wire for future installations not permitted.

335 Flexible metal conduit—ferrous metal, zinc coating permitted—only for flexible connections to motor terminals as an extension of 336 or 337 following.

336 Electrical metallic tubing—ferrous metal—enameled or zinc coated; permitted only where it is essential to embed wiring in masonry or concrete.

337 Rigid conduit—ferrous metal—enameled or zinc coated; for sizes over 2" in connection with permitted use as per item 336.

338 Conductor sizes shall be the minimum sizes permitted by 1940 National Electrical Code, except that varnished cambric insulated conductors larger than 3/0 AWG and rubber-insulated conductors (where permitted) in raceways or cable, shall be the minimum sizes permitted by the 1937 National Electrical Code. Rubber insulation permitted only on building wires (not including solidly grounded conductors) in wet locations.

## 340 Outlet boxes.—

341 Nonmetallic type.

342 Ferrous type, where connected to permitted metallic raceways or armored cable; zinc coating permitted.

350 Plates and wiring devices, such as convenience and special purpose receptacles, switches and lamp holders; nonmetallic plates, nonmetallic outer shells and covers for lamp holders.

## 360 Fittings.—

361 Clamps, lock-nuts, connectors, bushings and nipples—ferrous metal zinc coated.

362 Hangers, straps, supports, sleeves, and fastenings—ferrous metal; no metallic coating.

363 Cable connectors—copper and copper alloy for current carrying parts only.

370 Solder.—Solderless connectors desirable.

380 Lighting fixtures.—Nonmetallic materials—copper or copper alloy permitted for current carrying parts only—ferrous metal without metallic coating permitted only to the extent that nonmetallic substitutes are not available. Metal posts for supporting fixtures not permitted. Fluorescent lighting not permitted.

390 Low-tension communication assemblies.—One bell permitted for each dwelling unit located on the second floor or above, having an individual private stair leading to a private entrance at the street level. Private telephones not permitted.





## Have you ever teamed up with a Square D Field Engineer?

Conversion, expansion, and 24-hours-a-day operation have brought a lot of "tough nuts to crack" in every phase of production—and electricity is no exception. You'll find a Square D Field Engineer a source of sound counsel whenever you are confronted with problems of electrical control or distribution. He can help you simplify new jobs, and do old ones better. And backing him up in every Square D plant, are design and engineering

specialists with complete research and testing laboratories at their command.

There are Field Engineers in Square D branch offices in 52 principal United States and Canadian cities. Their services are dedicated to solving industry's war and post-war electrical problems.

 *Wherever Electricity is  
Controlled or Distributed*

SAFETY SWITCHES ★ CIRCUIT BREAKERS ★ MOTOR CONTROL  
★ SWITCHBOARDS ★ SQUARE DUCT ★ PRESSURE SWITCHES  
★ PANELBOARDS ★ MULTI-BREAKERS ★ WELDING CONTROL  
MILITARY ★ AIRCRAFT ★ MARINE ELECTRICAL CONTROL

**SQUARE D COMPANY**

DETROIT-MILWAUKEE-LOS ANGELES  
KOLLSMAN INSTRUMENT DIVISION, ELMHURST, NEW YORK  
IN CANADA: SQUARE D COMPANY CANADA LIMITED, TORONTO, ONTARIO



T. E. Kuryla (left), salesman, General Electric Supply Corporation, Erie, Pa., is shown in the photograph helping H. W. Alexander, manager of the Surgical Lighting Division of the American Sterilizer Co., Erie, to take off wiring devices, wire and conduit fittings needed for new germicidal units. Note unit on desk.



J. W. Davis (left), salesman, General Electric Supply Corporation, Joplin, Mo., is helping P. L. Maeder, Gray Electric Co., Joplin, to take off wiring materials for a rush industrial job.

The G-E wiring materials field force is divided into geographical districts in order to provide greater help for distributors and their customers. Here is J. O. Dillingham, manager of District No. 6. His headquarters are in San Francisco, Calif.



Seattle, Wash., General Electric Supply Corporation sales managers and salesmen are co-operating with customers in every way possible to aid the war effort. Here F. A. Block (left), supply sales manager, paused for this photograph while planning wiring materials delivery schedules for war project and W. E. Graham, marine fittings sales manager, is checking materials needed at shipyard.

# G-E

## WIRING MATERIALS DISTRIBUTORS

### Offer Help in War Production Centers the Country Over

Wiring materials suitable for war projects are handled by G-E Wiring Material Distributing Houses close to the projects. Over 175 of these distributors are located at key points in all parts of the United States. They are eager to join with customers in aiding the war effort.

See the G-E Wiring Materials Distributor near you for wiring materials needed for converting wiring to war purposes . . . for maintenance . . . for new wiring. You'll find this distributor's knowledge of new developments and methods helpful too.

The conduits, wires and cables and wiring devices handled by the G-E Wiring Materials Distributor near you are high quality. They are easy to install and will perform efficiently. Take advantage of this conveniently close source of materials. You'll be pleased with the helpful service given and with the materials.



#### FOR G-E WIRING MATERIALS

Ask the G-E Wiring Materials Distributor near you about G-E conduit, boxes and fittings, wire and cable and wiring devices to fit your needs. General Electric Co., Appliance and Merchandise Department, Bridgeport, Conn.



**GENERAL**  **ELECTRIC**